THE Chemical Age

VOL. LXXIII 12 NOVEMBER 1955 No. 1896

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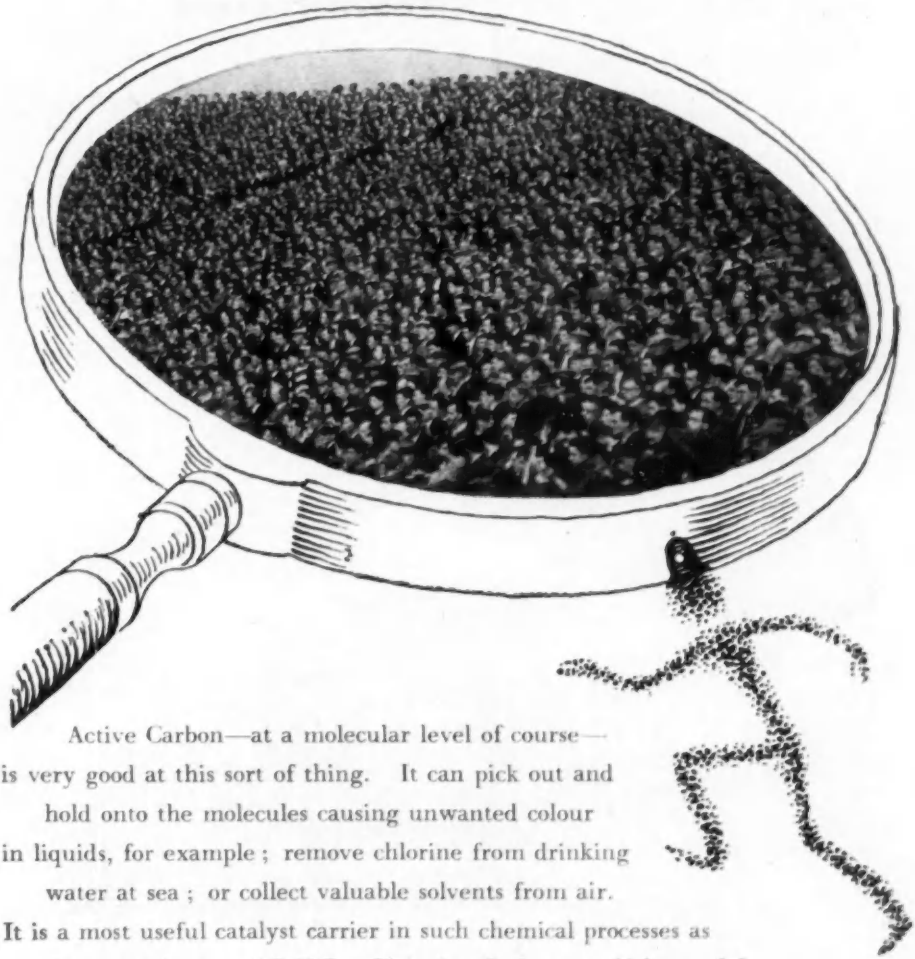

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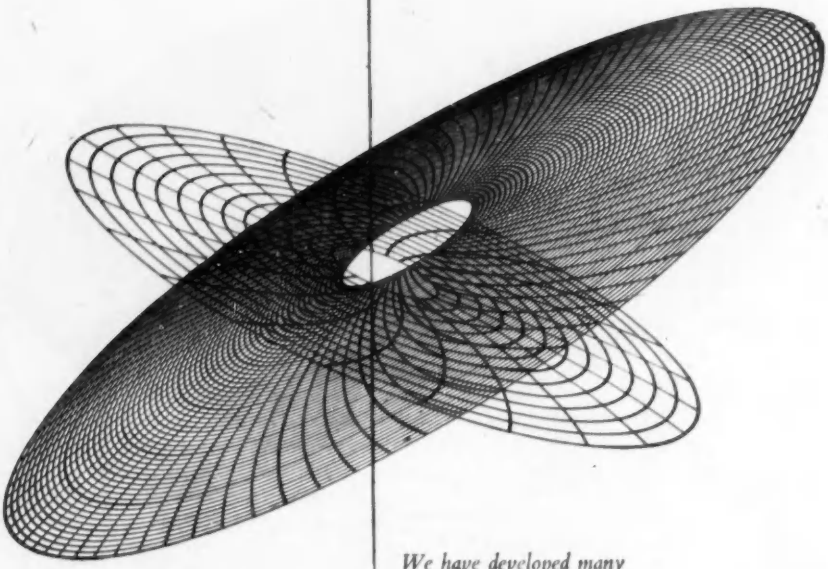

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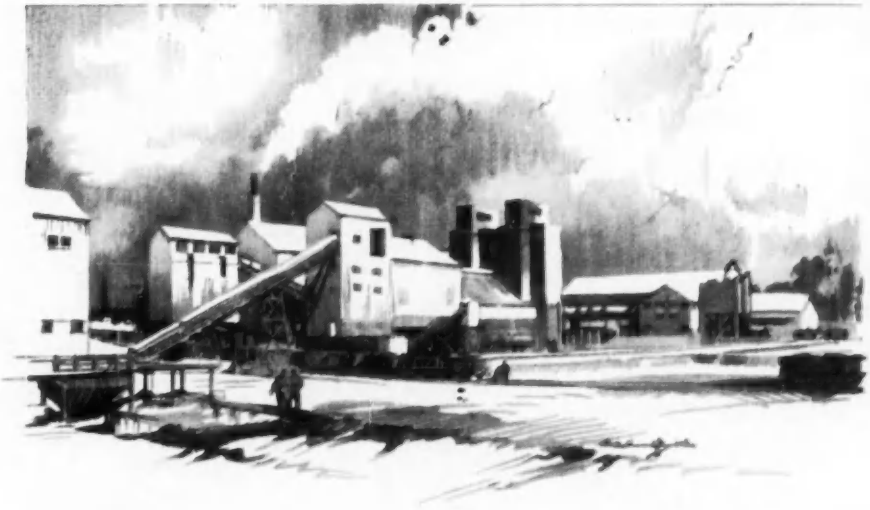

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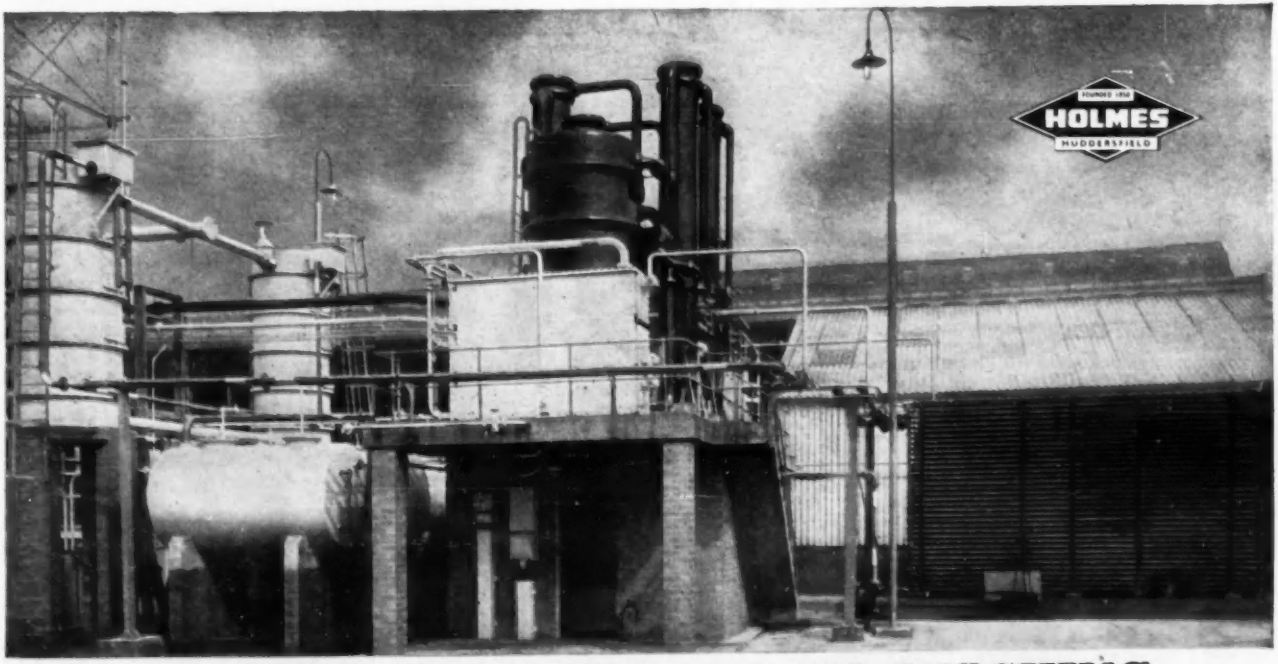

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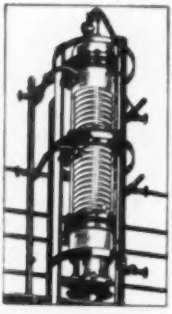

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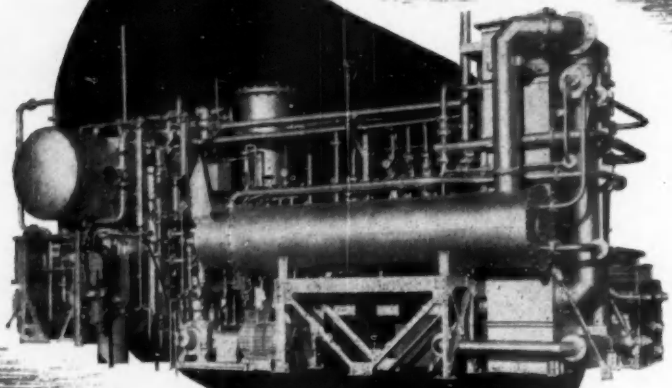

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"Many difficulties occur in the pursuits of the dairy farmer which render his occupation precarious. Such difficulties arise entirely from an ignorance of the scientific relations of the practice in which he is engaged."

Such difficulties arise

Evidently the scientific approach to dairy farming was already an active force 112 years ago, for the sentences quoted come from a paper 'On the Changes in Composition of the Milk of a Cow according to its Exercise and Food' delivered by Dr. Lyon Playfair in January 1843 and recorded in the first issue of the Journal of the Chemical Society. Modern dairy physiologists prefer to use a herd, or identical twin cattle, in their feeding tests, rather than the one cow of Dr. Playfair. Dairy analysts also seek greater accuracy in their control methods and find it by using B.D.H. reagents specifically prepared for milk testing purposes :—

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Fair Comment

ANY sign that British industry is becoming more boldly exhibition-minded must be welcome. The decision to hold the BIF for 1956 in two parts and at two different dates—in London from 22 February to 2 March, and in London and Birmingham simultaneously from 23 April to 4 May—certainly seems to be a forward step. It no doubt follows from the formation of British Industries Fair Ltd., which was formed in 1954 on the recommendation of a Government committee to take over the BIF from the Board of Trade. There is a new determination to widen the scope of BIF year by year. The London section of the fair is being split into two sessions because late April and May is too late as a seasonal buying period for many consumer goods. However, boldness seems to have been tempered with a final splash of caution, and only the ground floor space of Earl's Court was taken for the earlier showing. How much trade will *not* be won because space has not been available for otherwise willing exhibitors?

This first section of the BIF will have a 'Fair Within a Fair', the British Toy Fair. Within the Earl's Court section this Toy Fair will be the biggest single unit. It might be realistically pointed out that this will not represent an addition to the previous exhibition capacity of British industry. The separate British Toy Fair which has been held at Brighton in 1954 and 1955 has been brought into the BIF fold. To that extent, then, the new expansion of the BIF is not true expansion. More than 200 of the 460 exhibitors at Earl's Court will be toy exhibitors. Of the 250,000 square feet booked, 120,000 will be the 'Toy Fair'. The second part of the BIF at Castle Bromwich and Olympia will be technical-cum-industrial apart from hardware goods. That is to say, all consumer goods made by British industry except hardware goods must be exhibited for 1956 (so far as the BIF is concerned) in *half* the ground-floor space of Earl's Court. At a time when we so seriously need expansion in our export trade, it can rightly be asked whether this is enough, and without exaggeration whether it is half enough. In making these critical comments we do not want to disparage the efforts of BIF Ltd., but we cannot in honesty refrain from saying that their boldness has been displayed in half-measures. And this is no time for half-measures of salesmanship; it is a time for measures-and-a-half.

The chemical industry supplies all industries, and a substantial part of its fortunes depends upon the skill with which other industries use and sell its products. Also, the chemical industry has an outstanding post-war record for dove-tailing its own progress with the needs of the country. Its post-war expansion, more than that of any other industry, has reduced the indispensability of imports and increased the volume of exports. Nevertheless, the same burden of taxation must be carried by the chemical industry as by all others. Some differential apportionment of this burden, based upon individual companies' contributions towards import-saving or export-gaining, would have been an intelligent introduction into the 'emergency' Budget of 1955.

The second and double-sited section of the BIF will follow former patterns except that the electrical industry will support London as well as Birmingham —and with a new electronics section— and at Olympia the chemical industry will have a section described in advance as 'a section in itself', taking up 32,000 square feet, and fully representing the ABCM. All this is good progress, expansive in fact and spirit. Judging by information recently issued from BIF Ltd., it is now a dominant principle in the future BIF policy to encourage existing and separate trade shows to become 'fairs within fairs', to come in under the BIF 'umbrella'. This will make the BIF bigger and bigger, but only time and realistic analysis will show whether it actually enlarges the exhibiting capacity of British industry. One argument in favour of the 'umbrella' or 'all-together' policy is that publicity efforts abroad can be co-ordinated and should as a result be more intensive. How far this truly reaches the specialised buyers more effectively than specialised publicity is open to question. An obvious disadvantage is that too much centralisation of exhibition means huge crowds with all the attendant discomforts.

The present BIF management believes that the BIF is most successful in difficult times, that it is an exhibition receiving greater support when orders are more difficult to get. In easier times the BIF has been less supported. This view may well be justified for home trade, and it may seem as well justified by the success of the BIF during its 'export-only' period in the immediate post-war years. There is no reason to suppose now, when we need export sales expansion so urgently, that foreign buyers will automatically visit Earl's Court, Olympia, or Castle Bromwich in greater number. Practically all of the glory in the post-war export-only years was based upon the plain fact that any country with goods to supply was of interest to buyers. That easy background is no more.

We can turn appropriately to the annual report of the 10th International Fair of Ghent. This impresses upon foreign exhibitors the supreme importance of 'on-the-spot and personal' representation. At the 1955 Ghent Fair, only one out of 54 British exhibiting firms 'bothered to send a director along to "help out" their agent'— net result: 'the Germans, who were there in full force . . . did much better business.' The organisation running this Belgian fair has been blunt in British interests to the point of charity. They point out that agents represent other firms from other countries, and unless somebody effectively represents the manufacturing company as well, the goods and price lists and delivery dates will not be certain of a good showing. Although this organisation obviously would not seek to discourage exhibitors, British firms are told that unless they are personally represented they might as well save agents' and exhibition expenses.

We might extend and expand this line of thought. Are we likely to increase our export selling by putting so much into a centralised British Industries Fair and so little into participation in the established international fairs or exhibitions of Europe? At the last Ghent fair, there were 675 Belgian and 603 non-Belgian exhibiting firms. Germany had 185 exhibits, mostly with personal representation; Britain had 54, all but one without personal representation. All the expansion that the BIF can make, real or apparent, can hardly offset this neglect. It once was true that if you made a better article than anybody else, the world would wear its own track to your doorstep. Today the world's buyers are busy men and in any case we cannot assume that all British goods are superior to other countries' kindred products. We are fortunate that there are so many international fairs where we can take our goods for display. Perhaps many companies regard these fairs as 'rackets', as means of extracting exhibition fees and a host of associated costs. But how many companies have exhibited their goods well enough to expect a response? Most of the evidence, even today, points to a policy of exhibiting-by-proxy, to reliance upon agents, to absentee-salesmanship. Our main exhibiting efforts should take place on the floor-space of foreign buyers' countries. It is only one part of the task to ask them to come and see what we have at home.

Notes & Comments

Telling the Tale

A NEW FBI booklet deals with 'Telling Industry's Story Overseas'. Without indulging in general comment on this helpful publication, we are glad to see that major stress was laid upon trade and technical journals as media of information. 'Trade and technical journals are the best way of getting your story across to the distributor and buyer in overseas countries. . . .' Getting information about products into overseas publications of this kind can be a direct aim, but 'in any event you should be sure that your story is made available to the UK trade and technical Press'. This last piece of advice might seem too obvious to be necessary, but only to those without experience and working knowledge of the trade and technical Press itself. The reluctance of so many British companies to provide information about their products and activities is still remarkable to the point of being unbelievable. Those companies which have progressive outlook on this matter stand out as exceptions. More often than not, editors and responsible journalists have to seek out information arduously and lengthily despite the fact that they are offering a valuable opportunity for publicity. Not by any means infrequently, final appraisal brings the comment, 'we would rather you didn't publish that'. The fact that most UK journals have a useful overseas circulation, and the second fact that similar journals in other countries often abstract or borrow interesting items in our own journals, seem far too little appreciated. The new FBI booklet emphasises these points most forcibly, and we hope it will enjoy a wide readership.

Encouraging Authors

AN much this same subject, the policy of The Radio Industry Council in offering six annual 'premiums' of 25 guineas each to writers of technical articles dealing with radio and electronics must be highly praised. These awards will be made in respect of published articles which in the opinion of a panel of judges are likely to enhance the reputation of Britain in radio, television, and electronics. Writers have to get their articles accepted in the ordinary way, and may then submit the published article for consideration. Editors may draw attention to suitable articles. This scheme is actually in its fourth year. It might well be emulated by other industries. Its aim is to stimulate a greater flow of articles about the industry, and to encourage quality. How far this aim is actually achieved may not be known, but its effect must be beneficial. The chemical plant industry and the instrument and apparatus industries seem natural fields for this idea.

Deck Chair Chemistry

A RECENT dispute in the Queen's Bench Division reported in our sister journal, the *Hardware Trade Journal* (28 October, 1955), has some interesting chemical implications. An inventor of a new type of deck chair bought some 2,500 pieces of deck chair canvas from a firm of weavers; in fact, the order placed was much greater, but the initial deliveries became the subject of disagreement. It was stated by the buyer that the canvas had been dressed with Epsom salts up to almost a quarter of its weight and that this had no value except to make the material look better than its quality. It actually made the canvas pieces unfit for the known purpose for which they were bought because a stain was left whenever water dripped on to the material; a deck chair left out in the rain was soon in a very sorry state. The deck chair inventor's claim was supported by an award of damages, although the defendants stated that it was normal practice to dress this type of material with 'such a stiffening'.

Chemical Additives

THIS dispute raises several points about the policy of using chemical additives. Is it a good trading practice to use such heavy amounts of an

additive to give a textile material the appearance of possessing higher qualities than it can possibly display in performance? Surely this is bad for the textile trade and indirectly bad for the chemical trade as well? Chemical additives should enhance or fortify, but they should not give purely illusory effects. But if a chemical additive is considered necessary, why should one that is water-soluble and therefore impermanent be chosen? There must be a range of far more suitable chemicals nowadays, additives that would exert a real and durable stiffening effect and also be resistant to water. The use of Epsom salts, though stated in this case to be normal practice, seems incredibly behind the times.

Laporte's Plan Development

TO finance a capital development programme, Laporte Industries Ltd., are to issue 3,245,897 ordinary shares of 5s. each at 12s. 6d. per share. Most important items in this programme on which work has already begun, or is due to be started this year, concerns four divisions of the group.

Laporte Chemicals Ltd.'s factory at Warrington, Lancashire, is to have its electrolytic hydrogen peroxide plant extended and modernised to meet UK demands, and a large scale plant erected for the production of hydrogen peroxide by an autoxidation process (a non-electrolytic method).

To meet increased demands for titanium oxide in home and overseas markets the plant of Laporte Titanium Ltd. at Stallingborough, Lincs, is to be extended. The buildings for this expansion are already available.

Although it is not planned to increase the production of The Fullers' Earth Union Ltd., the modernisation of plant to be undertaken is to decrease production costs. Fourth project in the scheme concerns Laporte Chemicals (Australia) Pty., where expansions will be carried out at the hydrogen peroxide and sodium perborate plants.

It is estimated that the net proceeds of the present issue (about £1,980,000) should, together with retained profits, including depreciation, be sufficient to provide for capital expenditure up to 30 September, 1956, although the development programme is not likely to be completed before 1958.

Ammonia Synthesis Gas Plant

THE Power-Gas Corporation Ltd. have been appointed by Imperial Chemical Industries Ltd., Billingham Division, to act as main contractors in connection with a substantial extension of their ammonia synthesis gas plant.

The plant, which will be built to the overall technical direction of I.C.I. who are designing the oil gasification units, is a new departure in this country. Oil will be gasified with oxygen under pressure and the equipment to be provided will also include oxygen plant, carbon monoxide conversion plant, gas purification plant and compressors.

As part of the purification train The Power-Gas Corporation Ltd. are designing and supplying a plant for the removal of carbon dioxide and hydrogen sulphide by means of hot potassium carbonate solution.

'Chemical Abstracts'

ON Wednesday, 16 November, Dr. E. J. Crane, the editor, will discuss the 'Chemical Abstracts' service and its plans at a meeting organised by the Association of Special Libraries & Information Bureaux at the Royal Society of Arts, 8 John Adam Street, London W.C.2, at 6 p.m.

In addition to describing the organisation of 'Chemical Abstracts', Dr. Crane will outline the programme for the future which includes facilities for research, work on the fifth decennial indexes, and monthly indexes.

US Chemical Engineers to Meet

The American Institute of Chemical Engineers holds its annual meeting at the Hotel Statler, Detroit, Michigan, from 27 to 30 November. Mr. Walter G. Whitman, Secretary-General of the recent Geneva Atoms-for-Peace Conference, will address the Awards Banquet. The meeting will open on Sunday, 27 November, with a symposium on nuclear engineering education.

The Production of Colour

SLTC Manchester Meeting Hears Theory

THE fiftieth meeting of the Manchester Group of the Society of Leather Trades' Chemists was held at the Grosvenor Hotel, Manchester on Saturday, 29 October, and was preceded by a celebration luncheon, at which some 60 members and many ladies attended.

The business of the afternoon consisted of a lecture by Dr. T. Vickerstaff on 'Colours and How We See Them.'

The production of colour, said the speaker, is dependent first of all on the presence of light. Without light there can be no colour. However, light alone is not sufficient, for in sodium light there is no colour except yellow. Only in so-called white light can the full range of colours be seen. The reason for this is that white light consists of a balanced mixture of radiations of different wavelength or colour. Due to the construction of the eye and the brain, this balanced mixture, corresponding to sunlight, is appreciated as neutral, uncoloured, white light.

The existence of these different radiations can be demonstrated by passing the light through a glass prism to form the spectrum. It can be seen also in nature in the rainbow and in the colours of oil films and soap bubbles. Most colours are produced in nature by upsetting the balance of the radiations. Thus, when white light falls upon a green object, the colouring matter absorbs the blue and the red light but reflects the green unchanged. This principle is used in the scientific measurement of colour by spectrophotometers.

For the appreciation of colour, however, a further requirement is a human observer and the structure of the eye plays an important part in determining colour effects. This is illustrated in the illusions which can be produced in black and white and in the phenomena of after images in colour. Such effects can alter the perception of colour in everyday life, although their existence may not be appreciated. Effects of this kind are common in woven structures and in printed designs. These effects are also well known to artists and are used by them to produce special effects.

An almost infinite range of colours can

Committee members are seen with the speaker, Mr. T. Vickerstaff (I.C.I. Dyestuffs Div.), examining some of the material brought for the after lunch talk. Left to right: G. Cooper, vice-chairman (Puritan Tanneries, Ltd.); J. H. Hall, committee (Yorkshire Dyeware and Chemical Co., Ltd.); Professor Donald Burton (group founder); H. Lee, chairman (Richard Hodgsons and Sons, Ltd.); T. Vickerstaff; Miss B. Hills, secretary (Metropolitan Leather Co., Ltd.); K. B. Marks, retiring chairman (Yorkshire Dyeware and Chemical)

be produced by mixing. The eye detects only three primary colour senses, namely, red, green and blue. By mixing coloured lights in varying proportions, any other colour can therefore be imitated. This is known as additive colour mixing. Coloured pigments act in the opposite sense by subtracting the same three primaries from white light, but equally well a whole range of colours can be produced by mixing three primary pigments or dyestuffs. The so-called subtractive primaries are therefore, magenta, yellow and blue-green, corresponding to the subtraction of green, blue and red light respectively from white light.

Both subtractive and additive colour mixing have been used in colour photography, although at the present most of the systems in use are subtractive. In dyeing, colour mixing is very widely used, but may sometimes give rise to unusual effects when the illumination is changed. The range of dyestuffs required in practice is very much extended by the use of different fibres and the demand for different fastness properties.

Joint Fertiliser Project

To Cost £11,000,000

AS A RESULT of a long-term agreement about to be signed between Shell Chemical Company Limited and Fisons Limited, work will shortly begin on the construction of two new plants in the Thames Estuary for the manufacture of fertilisers. It is estimated that this dual project will cost altogether £11,000,000.

The first of these plants, costing £6,500,000, to be built at Shell Haven in Essex, will convert refinery gases (or other petroleum hydrocarbons) into ammonia and nitric acid. This initial stage of a longer term project will be completed by 1958 with a capacity of 75,000 tons of ammonia a year. Subject to the necessary land being available, the complementary plant will be built by Fisons nearby at a cost of £4,500,000. It will use 60,000 tons of ammonia from Shell Haven for the production of ammonia based fertilisers.

The balance of the ammonia output at Shell Haven will be used by Shell for the manufacture of ammonium nitrate/limestone fertilisers for the UK market. In addition, anhydrous ammonia and nitric acid will be made available to industry.

In carrying out this programme Shell will draw upon experience acquired in the US and in Holland, where it already manufactures ammonia on a large scale.

The very considerable rise (56 per cent) in agricultural production in the UK since 1938 has been in great measure due to the increased use of fertilisers. Abundant availability of synthetic fertilisers will materially assist in increasing home food production. Their wide use on grassland, which has long been practised on the Continent, and strongly advocated here by the Ministry of Agriculture, should add substantially to domestic meat supplies, it is claimed. According to Ministry estimates, some 450,000 tons of nitrogen (derived from approximately 500,000 tons of ammonia) could profitably be applied annually for this purpose in this country.

Frasers' New Pilot Plant

A NEW plant for pilot scale investigations has been built by W. J. Fraser & Co. Ltd., the chemical engineers, at Harold Hill, Romford, Essex. The new plant, which will come into operation before the end of this year, will replace the company's previous laboratories at Dagenham.

The plant building, in which research into various chemical processes—including high temperature vapour and liquid phase heating, high vacuum distillation and evaporation problems—will be carried out, consists essentially of a main building 36 ft. by 20 ft. by 35 ft. high. It is a steel-framed structure, clad with corrugated asbestos sheeting. Various ancillary buildings, such as the experimental laboratory, entrance hall, boiler house, stores and outside shed, are all brick built. The exterior of the main building is protected with an 'Epikote' resin based paint.

The plant has been designed to permit the maximum flexibility of service and the complete changing of plant to meet particular problems and needs.

Work Started on Sulphuric Acid Plant

Construction has begun at Shawinigan Falls, Quebec, of a new sulphuric acid plant for The Shawinigan Chemicals Ltd. The plant, which will cost approximately $750,000 and have a capacity of 25,000 tons of sulphuric acid per year, is expected to start production in the latter half of next year.

Corrosion of Turbine Cylinders

Analysis of Gaseous Impurities of Steam

IN many ships severe corrosion of the low pressure turbine cylinders is encountered. This attack occurs only in the wet region of the turbine and is thought to be associated with the action of dissolved gases from the steam. The chemical section of the Parsons & Marine Engineering Turbine Research and Development Association (Pametrada) has been given the task of determining the amount of foreign gases in actual steam turbine installations and also of finding out their composition. Among the biggest sources of difficulty in investigating this problem is the very low order of gas concentrations which are expected. Concentrations are possibly below one part per million when the steam pressure is higher than atmospheric.

For the collection of gas samples at sea a special apparatus has been developed. It consists essentially of a glass dome with a stopcock on top, to which can be attached a gas sampling tube by means of pressure tubing. The glass dome is seated on a rubber gasket and inside is a coil through which either steam or cold water can be passed. Down the centre of the coil is an overflow tube. On the baseplate of the dome is an inlet ring for the steam which is to be sampled, and the dome can be filled with mercury from an outside reservoir through an orifice which is also on the baseplate.

Steam Purging

Before taking a sample, the apparatus with the sampling tube attached is well purged with steam; at the same time, steam is passed through the coil to heat the inside of the dome. The stopcocks on the dome and sample tube are closed, cold water is passed through the coil, and the steam is allowed to condense until the condensate reaches the overflow pipe. The steam is then cut off and the condensate is heated nearly to boiling by passing steam through the coil. Mercury is then allowed to go gradually into the dome, the stopcock is opened, and the uncondensed gas is collected in the gas sampling tube. The stopcocks are closed and the condensate forced down the overflow pipe, collected and weighed. The vessel is sealed in paraffin wax and brought to the Pametrada Research Station at Wallsend on Tyne.

The analyser is based on a similar apparatus suggested by L. K. Nash (Inst. Eng. Chem., 1954, **18** [8], 505) and is capable of dealing with samples from 0.2 ml. to 6.0 ml. of gas at STP. The analysis is carried out at reduced pressure, in the region of 10 microns, to increase the gas volume. It consists of three main parts: an analytical portion, a high vacuum pump and backing pump for evacuating the apparatus and transfer of the sample, and a Töpler pump for manipulation of the sample. In general, the method of analysis consists of measuring the volume of gas in a burette before and after treatment with various reagents and calculating the gaseous composition from the changes in volume.

Several Possibilities

The analytical portion is capable of determining carbon dioxide, oxygen, hydrogen, carbon monoxide and methane. Nitrogen and inerts are taken by difference. Ammonia and sulphur dioxide, sometimes present in small quantities, are not determined.

By means of the Töpler pump, the sample is circulated several times through a reagent tube containing magnesium perchlorate to remove water, then several times through ascarite to remove carbon dioxide. A known volume of oxygen is next added to the gas in the burette, which is then circulated repeatedly over a combustion catalyst comprising a platinum wire heated to 475°C, to burn hydrogen and carbon monoxide. The residual gas is again passed over the platinum catalyst heated to 950°C to burn methane. The remaining steps necessary in a complete analysis are circulation over ascarite to remove CO_2 from CH_4 combustion, addition of H_2 in slight excess for combustion of excess O_2, and circulation over hot catalyst to burn excess O_2.

The volume, pressure and temperature are measured after each of these operations and converted to the corresponding volumes at STP. The expected overall accuracy of a complete analysis is ± 2 per cent.

Big Company Deal

Albright & Wilson to Buy Marchon

ALBRIGHT & Wilson Limited announce their arrangements for the purchase of Marchon Products Limited, Whitehaven, Cumberland, through the acquisition of the ordinary and preference share capital of Marchon Products which also controls the ordinary share capital of Solway Chemicals Limited.

For some time it had been apparent that, due to Marchon Products' rapid expansion, its ordinary share capital had become completely out of gear in relation to the total capital employed in the business. In the past, it had been the practice to finance the expansion in Marchon mainly by ploughing back all profits, but the necessity arose to find additional capital in the form of loans, particularly for the consideration of the Solway sulphuric acid-cement plant.

The large production capacity of sulphuric acid now existing in Whitehaven provides the basis for further development of Marchon's activities, particularly in regard to the manufacture of phosphates, for which there is a constantly rising demand. But the capital needed for such further expansion could not be raised without enlarging the financial basis of Marchon-Solway. To attempt this by the issue of additional ordinary share capital presented difficulties, for various reasons. In consequence, the method was adopted of incorporating Marchon-Solway into an existing organisation which had the facilities lacking in Marchon.

Different Processes Used

Friendly relations between Marchon and Albright & Wilson Limited have existed for many years and, whilst both companies are engaged in the manufacture of phosphoric acid and its derivatives, they are operating entirely different processes. The considerable interests which both companies have in other fields do not overlap in any way. Therefore, the link up can be regarded as a means of strengthening both organisations, and it is confidently assumed that by the pooling of such resources as research and engineering, etc., a considerable increase in the efficiency of operating combined units will result.

Albright & Wilson will extend an invitation to Mr. Frank Schon, the chairman of Marchon Products Limited to join them after certain formalities are completed early in the New Year.

Mr. Schon, assisted by an able team of colleagues, has built up over the past 15 years a business of which he has every reason to be proud say Albright & Wilson. Detergent intermediates, sulphonates, higher fatty alcohols, and sodium tripolyphosphate are among the main products manufactured by Marchon Products, while Solway Chemicals are now operating their plant for the production of sulphuric acid and cement from anhydrite, which is mined on the company's property.

The increased resources arising from the association of Albright & Wilson and Marchon Products will provide many opportunities for the expansion of joint interests both at home and especially overseas.

New Shell Chemical Plant

THE growing share of synthetic detergents in the total detergents market, now running at over 40 per cent in the United Kingdom, is emphasised by the construction of a new Shell Chemical plant at Shell Haven, Essex. Due to be completed in January at a cost of £1,250,000, this plant has been designed for an initial yearly production capacity of 20,000 tons of alkylbenzene. This is the basic material for most of the popular household detergent powders in use today.

Producer of the first bulk supplies of alkylbenzene for the United Kingdom and still its major supplier, Shell Chemical hitherto has had to import the material from Curacao in the Netherlands West Indies. Alkylates for high-grade aviation spirit were manufactured there by Shell during the last war.

The petroleum based feed stocks for the new plant will come for the most part from Shell's UK refineries.

Embodying the results of considerable research and development which will be reflected in the quality of the product, the new plant will be the first major chemical unit to come into production at Shell Haven. It is another illustration of the growth and expansion of Shell Chemical's operations and its intention to utilise major refining facilities for this purpose whenever practicable. Being on the Thames Estuary, Shell Haven is well sited to meet the growing demand for alkylbenzene from both home and overseas manufacturers.

Notes on Paper Microtechnique for the Industrial Chemist

by S. M. CHARLETT, F.R.M.S.

AMONG the great variety of materials he is called upon to examine and deliver an opinion on, the industrial chemist must list paper, in its many varied forms, as one of the very frequently encountered subjects. The microscopical examination of paper yields much valuable information as to purity, relative strengths of various samples, and suitability for different purposes. The ability to differentiate the various fibre types used in the manufacture of paper, and to estimate the relative proportions of different fibres present in a sample, is a useful accomplishment and a valuable acquisite to the laboratory worker. Fortunately nowadays, such an accomplishment does not entail a deep knowledge of fibre structure, as over the years a number of differential stains have been devised by various workers which have the property of staining fibres of different origins in different ways so that the worker can distinguish between them. This is particularly valuable when examining a sample containing a mixture of fibres.

It is not the intention of this article to describe the microscopical appearance of fibres (there has been a vast amount of literature published upon this subject) but rather to outline some of the methods and reagents employed by microscopists to make and preserve microscopical preparations of paper.

Pretreatment Necessary

When received by the laboratory for examination the paper sample may not be in a condition suitable for immediate investigation. It will more than likely contain certain agents known as fillers or dressing, and may have been treated with various dyes or pigments. In addition, certain types of paper may have been coated with resins, or synthetic agents such as viscose. Before the analyst can proceed to examine such samples all the extraneous matter must be removed. Where the specimen is not coated but has just been treated with fillers, as is the case with most general purpose papers, it may be purified by boiling a portion of the sample in a one per cent aqueous solution of sodium hydroxide. The specimen so treated should then be well washed in distilled water, until the washings give no colour with a drop of phenolphthalein; it is then ready for treatment described later.

More Drastic Methods

This treatment is satisfactory for uncoated papers, but where the sample has been treated with viscose or resin the method used is slightly more drastic. In the case of viscose coated papers, the technique described by Browning and Graff (1) has been found to be of great value. A portion of the specimen about 1 cm. square is treated by dropping into a 50 per cent aqueous solution of calcium nitrate which is held at just below boiling point. The sample is allowed to remain in the hot reagent until it appears to be on the verge of disintegration. At this point the solution is tipped off and the specimen well washed with fresh, cold, distilled water. Disintegration is completed by subsequently boiling the specimen in 0.5 per cent sodium hydroxide, rinsing in 0.5 per cent hydrochloric acid, and then washing the fibrous mass with distilled water. Separation of the fibres may be completed by transferring the mass to a stoppered flask containing distilled water, and shaking very vigorously for five minutes.

For resin coated papers a different technique must be used. The writer has found that the following method will ensure complete removal of resin coatings. A portion of the sample, about 1 cm. square, is treated as follows:—

(1) Thoroughly extract for 30 minutes with 60 ml. of carbon tetrachloride, or chloroform. This is best done by making three separate extractions of 10 minutes each, using 20 ml. amounts of the solvent.

(2) Transfer to N/10 nitric acid, and raise the temperature to 65-70°C for 10 minutes.

The sample will now be free from resin, and any fillers may be removed by the treatment described previously.

It may be found that a sample is coated with both viscose and resin, in which case the technique described by Kirret (**2**) may be employed. In this the resins are first removed as outlined above, by chloroform and nitric acid treatment, and the resin free sample then immersed in 60 ml. of dilute zincate reagent. This is prepared as follows:—75 g. of zinc oxide is dissolved, with the aid of gentle heating, in 200 ml. of 75 per cent aqueous sodium hydroxide. The solution is then diluted to 1,000 ml. with distilled water.

The reagent is allowed to act for an hour at room temperature, with frequent vigorous shaking. At the end of this time the mixture is filtered through a sintered glass filter and the viscose free residue then washed with a further 50 ml. of the zincate solution. This is followed by 30 ml. of 10 per cent sodium hydroxide, 200 ml. of N/5 hydrochloric acid, 1,000 ml. of hot distilled water and 100 ml. alcohol. The residue may then be dried and treated by one of the methods outlined below.

Fibres Separated

Frequently, once a sample has been freed from the various fillers and coatings, it is desirable to separate the component fibres. At first sight this appears an impossible task, and indeed it is by no means simple. A fairly reliable technique for this purpose was devised by Lasse (**3**). This worker utilised the difference in the specific gravity of various fibres to facilitate separation. The specimen having been freed from extraneous matter, a small portion about the size of a pea is placed in a 50 ml. stoppered cylinder, together with about 30 ml. of a liquid of suitable specific gravity, chosen as described below. The stopper is inserted and the cylinder vigorously shaken for five minutes, and then allowed to stand in a warm place for about an hour; a 37°C incubator is ideal.

At the end of this period the fibres will be found to have separated into layers at various levels in the liquid, according to their specific gravity in relation to that of the medium used. Numerous liquids have been used for this technique including alcohol, benzene, ether, chloroform, castor oil, liquid paraffin, and combinations of these depending upon the specific gravity required. Specific gravities of some fibres are cotton 1.48-1.56, linen 1.46, plant fibres 1.50, natural silk 1.37.

Once the fibres to be examined have been prepared by one of the above methods, either as a mixture or separated, the preparation for microscopical examination can proceed.

The experienced worker may find it simple to recognise the various fibres by their microscopical appearance, in which case a very small portion of the sample is placed in the centre of a clean microscope slide together with a drop of distilled water. The component fibres are then separated as much as possible with the aid of a pair of histological needles, the operation being carried out in such a way as to leave the individual fibres almost parallel with each other. The preparation may now be covered with a clean cover glass, and then examined under the desired microscope objective.

This technique is quite useful when employed by an experienced technician, but in the case of less experienced personnel it can lead to the overlooking of quite important features. To overcome this possibility numerous reagents have been devised, many of which are used by skilled personnel because of the increase in definition produced. One type of special reagent employed is that known as a clearing agent. This, as its name implies, clears the specimen rendering it far more transparent, thus enabling otherwise obscured details to be observed. There are a number of such agents available for general histological purposes, and two of these which are eminently suitable for use with fibres are chloral hydrate and lacto-phenol, these may be prepared as below:—

Chloral Hydrate

Chloral hydrate (crystals)	130 g.
Distilled water	80 ml.

Dissolve, and store in a dark glass container.

Lacto-Phenol

Picric acid (saturated aqueous solution)	10 ml.
Lactic acid	20 ml.
Phenol (crystals)	20 g.
Distilled water	10 ml.

Dissolve the phenol in water, add lactic acid and glycerine. Store in a dark glass container.

The technique for these reagents is the same in each case. Two drops of either lacto-phenol or chloral hydrate are placed in the centre of a clean microscope slide. A small amount of the fibre under examination, which has been desized as described earlier, is transferred to the reagent, and teased out with histological needles until the fibres are separated as much as possible. The preparation is then covered with a clean cover glass, and placed in a 37°C incubator

for 10 minutes. Subsequent examination of the preparation under the desired microscope objective will reveal the fact that detail has been very much enhanced, the fibres having been rendered more transparent enabling both internal and external features to be examined.

As was noted earlier, some workers have the ability and experience which enables them to differentiate various fibres by their microscopical characteristics, and that mounting specimens in one of the above clearing agents will reveal sufficient detail to identify them by. The less experienced worker, however, will need some other means of differentiating between fibres of various origins and for this purpose a variety of differential stains have been devised which are capable of such action. Such stains will produce definite reactions for one or more of the fibres likely to be encountered in paper specimens.

Preparation of Fibres

As important a part of the procedures, as distinct from the actual staining itself, is the preparation of the desized, decoated fibres for treatment. Having performed the purifying operations outlined earlier, it is best to keep the fibres so treated in a test tube containing a little water. If the material is in a fairly heavy concentration in the test tube, all that is necessary to obtain a sample is to insert the tip of one of the histological needles, used for teasing specimens, into the mass and to use the small amount which adheres for staining treatment. The small blob of fibrous material is removed to the centre of a clean microscope slide, and teased out with needles until the fibres are well separated. Excess water is then removed with the aid of a small piece of blotting paper, carefully blotting around the edge of the preparation, taking care to avoid the fibres themselves. The preparation is then allowed to air dry, and may subsequently be treated with one of the differential stains outlined below.

The value of the iodine solutions as differential fibre stains was known by many early workers, but one of the earliest descriptions of both reagent and technique was given by Aiyah (**4**) in the Indian Custom House method of estimating relative amounts of sulphite and mechanical wood pulp fibres in mixtures. This worker used Herzeberg's stain, which is prepared as follows:—

Dissolve 50 g. of dry zinc chloride in 25 ml. of distilled water. Measure the specific gravity at 28°C and if it is above 1.800 reduce it to this figure by the addition of more distilled water. Dissolve 5.25 g. of potassium iodide and 0.25 g. of pure iodine, in 12.5 ml. of distilled water, add to the zinc chloride solution, stir well and allow to stand in the dark for 24 hours. Filter into a dark glass container and store in a dark, cool place.

To use the Herzeberg stain apply two drops to fibres prepared on a microscope slide as described earlier, cover with a clean cover glass, and allow to stand for five minutes. Examine the preparation under the desired microscope magnification when, if the appropriate fibres are present, the following reactions may be observed:—

Lignified tissue — Groundwood — Jute — Flax — Untreated Manila Hemp.	Bright Yellow
Esparto — Bleached Soda and Sulphite Pulps — Bleached Straw Pulps.	Blue or Violet Blue.
Cotton Fibres — Bleached Hemp	Maroon Red.

For accurate results the reagent should be freshly made up once a fortnight.

Further investigations into differential fibres stains were carried out by Leach (**5**) who found that Schulze's chlor-zinc-iodide could be used for such a purpose. This reagent may best be prepared in the following manner:—

To a few grams of pure zinc add 35 ml. of concentrated hydrochloric acid, and allow the reaction to proceed, adding fresh zinc until effervescence ceases and excess zinc remains. Decant 30 ml. of the solution thus made into a clean beaker, and add five g. potassium iodide and one g. iodine. Store in a dark glass container, use after 12 hours, do not keep for longer than two months.

The stain is applied in the same way as Herzeberg's, and gives similar reactions.

Rowe (**6**) used a simple, aqueous solution of iodine, and found that some quite specific reactions could be obtained from various fibres, as in the case of soda-pulp (pale orange) and cotton (pale yellow).

From these fundamental investigations later workers formulated other quite widely used variations of the iodine based stains. Sutermeister's stain, for example, is made up as follows:—

(1) 1.8 g. potassium iodide, and 1 g. iodine, dissolved in 100 ml. distilled water.

(2) 56.3 g. calcium chloride, dissolved in distilled water, and made up to 100 ml.

In use, the fibres prepared as above on a clean slide are treated with one drop of solution (1) for two minutes. The excess liquid is then removed with a piece of filter paper, avoiding the fibres. One drop of solution (2) is then added to the preparation which is then covered with a clean cover glass and put in a warm place for five minutes. Microscopical examination will reveal colour reactions similar to those of the Herzeberg stain, but which tend to be a little more specific as indicated below:—

Groundwood	Yellow
Jute or manila	Green
Bleached deciduous soda pulp	Dark Blue
Bleached sulphite pulp	Violet
Cotton, hemp, ramie	Dull Red

This stain is not affected by light, but must be protected from evaporation by keeping in an airtight container. The colour reactions are permanent and suitable for permanent preparations.

Selleger's reagent is another of the well-known fibres stains used by the paper technologist which is iodine based. This may be prepared as follows:—

Dissolve 1 g. of iodine in 3 ml. of three per cent aqueous potassium iodide. Add to a solution of 100 g. calcium nitrate in 50 ml. distilled water, allow to stand for seven days, filter, and store in an airtight container.

The fibres under examination should be prepared in the usual way, two drops of Selleger's reagent are added, and the preparation covered with a clean cover glass. After allowing the slide to stand undisturbed for ten minutes microscopical examination will reveal the following reactions in the presence of the appropriate fibres:—

Lignified fibres	Yellow
Straw	Pale Blue
Jute	Mauve
Sulphite pulp	Pale Red
Unbleached or semi-bleached pulps	Violet
Esparto	Deep Blue
Linen or cotton	Dull Brick Red

The colour reactions are fairly permanent provided that exposure to light is kept to an absolute minimum.

In addition to these comparatively simple iodine stains a number of rather more complex types have been developed. Most of these are far too specialised for the scope of this article, but the writer would like to refer to two of them in passing as of possible interest to workers.

Alexander's stain is a reagent used to distinguish between coniferous and deciduous pulp fibres. It is more complex than the usual iodine stains, being composed of the following three solutions:—

(1) 0.2 g. of congo red dissolved in 300 ml. of distilled water, filter and store.

(2) 100 g. of calcium nitrate dissolved in 50 ml. distilled water, filter and store.

(3) The normal Herzeberg stain, prepared in the usual manner.

The fibres under test are prepared on a microscope slide in the normal manner, and allowed to dry. Two drops of solution (1) are allowed to act upon the fibres for one minute, and the excess liquid is then removed with a piece of filter paper, and the slide allowed to dry. Three drops of solution (2) are then allowed to act for one minute, after which one drop of solution (3) is added. The preparation is then covered with a clean cover glass and allowed to stand for 2-3 minutes before examination. The deciduous fibres stain a deep blue, the broad cells are sometimes a little lighter than the rest of the fibre, but if these are stained then the reagent is working properly. The coniferous fibres stain pink. Colour variations may be obtained by adjusting the balance of congo red and Herzeberg's stain, to suit personal tastes.

The last of the iodine stains which we have space to consider here is the 'C' stain of the Graff series of iodine stains. This series consists essentially of modified chlorzinc-iodide reagents. The 'C' stain is the most useful of these and is employed to differentiate between bleached and uncleached pulps. The stain consists of four solutions made up as follows—

(1) 1.8 g. potassium iodide, and 1.3 g. iodine dissolved in 100 ml. distilled water.

(2) 40 g. aluminium chloride dissolved in 100 ml. distilled water.

(3) 100 g. calcium chloride dissolved in 100 ml. distilled water.

(4) 200 g. zinc chloride dissolved in 100 ml. distilled water.

For use, the staining solution is made up from these solutions in the following order:—

Mix 20 ml. of solution (2), 10 ml. of solution (3) and 10 ml. of solution (4) in a beaker, and then add 12.5 ml. of solution (1). Pour the mixture into a cylinder, and allow

to stand for 24 hours in the dark. Siphon off the supernatant fluid, taking care not to disturb the sediment, into a dark glass bottle, and store in the dark.

Although this stain is used primarily to distinguish between bleached and unbleached chemical pulp fibres, the writer has found it, to give the following staining reactions, which are quite specific:—

Cotton, linen, bleached manila hemp, cottonised bast fibres ..	Brick Red
Bleached sulphite fibres	Red Violet
Bleached soda and sulphite, deciduous fibres, straw, esparto ..	Dark Blue
Jute, raw manila, flax, lignified fibres in unbleached sulphite pulps, and any other lignocellulose fibres ..	Green-Yellow
Groundwood fibres	Bright Yellow

This concludes the section on the iodine stains. Such stains are quite valuable for the differentiation of fibres in mixtures, but as can be seen they are expensive to prepare, and tend to grow more complex. Where it is only desired to distinguish between, for example unbleached sulphate and sulphite pulps, or between bleached and unbleached pulps, the technologists may find it an advantage to resort to the normal histological stain either in combination or individually. Such methods are dealt with in the following section.

Butcher (7) in some of the earlier investigations into methods of differential fibre staining used the long established histological stains haematoxylin and safranin to distinguish between lignified and cellulose fibres. The following technique may be used with these stains:—

A slide, prepared as described earlier, is treated with Erlich's haematoxylin* for 10 minutes, rinsed in running tap water until all colour ceases to come away, and then immersed in a one per cent aqueous solution of safranin for two minutes. The slide is then rinsed in distilled water, and allowed to dry. One drop of fresh distilled water is then placed on the preparation, a clean cover glass added, and the slide examined under the desired magnification. The lignified fibres will be seen stained red and the cellulose fibres stained blue.

Leach (5) made extensive fibre stain studies, including the iodine stains, and devised the following combination for distinguishing between chemical and mechanical wood pulp fibres:—

(1) Three per cent aqueous Coomassie Brilliant Blue.

(2) Three per cent aqueous Chlorazol Fast Blue.

(3) Six per cent aqueous potassium persulphate.

Equal portions of these three stains are well mixed, allowed to stand for one hour, and then filtered. It should always be freshly prepared.

To stain a specimen with this stain a slightly different technique is employed than heretofore:—

About 20 ml. of the mixed stain is placed in a small beaker and raised to 95°C and a small portion of the desized sample is dropped in and allowed to remain for 30 seconds. The material is then removed from the stain, washed in running water until no more colour comes away, and then teased out in the centre of a clean microscope slide. A drop of water is added, the mount covered with a clean cover glass, and examined under the microscope. The mechanical wood pulp fibres will be seen stained deep blue, and the chemical wood pulp fibres dark red.

Agahd (8) devised a method of distinguishing between soda and sulphite pulp fibres. Using a combination of 45 parts aqueous Brilliant Dianyl Green G, and 15 parts aqueous Rhodamine B, this worker found that moistened with this mixture fibres appeared blue in normal light, but as soon as they were exposed to ultra-violet light very specific reactions could be noted. Soda wood pulp fibres appeared blue, and sulphite pulp fibres rose red.

From these early results stemmed other complex combinations too numerous to mention here. Such dyes as congo red, ruthenium red, methylene blue, and many others have been used individually and in combination, but these are usually very specific for one particular fibre. One such stain, used frequently by the writer, may be mentioned because of the permanence of its action. This is prepared to the following formula—

Lauth's Violet, or Methylene Blue	0.4 g.
Glycol monoacetate	100.0 ml.
4 per cent aqueous aniline sulphate ..	100.0 ml.

Dissolve the dye in the aniline sulphate, add glycol monoacetate, filter and store in a dark glass container.

The sample to be treated should be freed from all dressing as described above. The

**The formula for Erlich's haematoxylin may be found in any zoological treatise, there is not room to give it here.*

slide is then stained for three minutes, washed in distilled water until colour ceases to come away, and allowed to dry. A drop of distilled water is then placed on the preparation, a clean cover glass added, and it may then be examined as required. It will be found that the following reactions occur in the presence of the fibres mentioned:—

Soda wood pulp fibres	Deep Blue
Mechanical wood pulp fibres ..	Yellow to Brown

Sulphite pulp gives little or no reaction, but may show very faint yellow tinge.

In addition to the iodine stains and the dye stains there is another group of very selective reagents which are purely chemical, and rely on chemical reaction to produce characteristic results, and are mainly used for the detection and estimation of groundwood fibres. These are considered in the following section.

A solution of phloroglucinol in hydrochloric acid will give a definite magenta colour to groundwood fibres. This reagent may be prepared in the following manner:—

Dissolve five g. of phloroglucinol in 125 ml. of concentrated hydrochloric acid. Dilute to 250 ml. with distilled water. Store in the dark as light destroys ability to react.

A drop of the reagent is applied to a specimen of the material under examination, on a clean slide, a cover glass added, and the preparation examined under the microscope. The depth of colour produced in a specimen is an index of the proportion of groundwood fibre present, and may be used as a method of estimating such fibre provided standards are first established by the examination of known mixtures.

An alternative method of preparing the reagent, which the writer has found very useful on many occasions is:—

Phloroglucinol	2 g.
Hydrochloric acid (conc.)	50 ml.
Alcohol (95 per cent)	100 ml.

Dissolve and store as in original formula.

Another reagent which has found wide application in the examination of fibres is aniline sulphate, which again gives a characteristic colour to groundwood fibres:—

Dissolve five g. of aniline sulphate in 50 ml. of distilled water and add one drop of concentrated sulphuric acid.

This solution will stain mechanical wood pulp fibres yellow, and in papers containing a high proportion of such fibres the colour is an index of the percentage, the reaction not usually being visible to the unaided eye below about 30 per cent groundwood.

One last chemical reagent which has been found very useful in the examination of paper is paranitraniline. A saturated solution of this substance in concentrated hydrochloric acid will produce an orange-yellow colour in all groundwood fibres.

There is not room here to deal with the estimation of fibre contents in very great detail, but it may be of interest and value to the reader to very briefly outline the general methods employed.

There are two main methods for the estimation of relative fibre percentages in a mixture, the estimation method, and the counting method. The latter is the accepted practice for the estimation of fibre percentages in mixtures. In this the microscope is fitted with a cross-wire in the eyepiece. A slide of the sample is prepared and stained by one of the above methods, depending upon the information required. The slide is then placed under the microscope stage and one edge of the fibre mass is brought into focus. Using the stage controls the slide is now moved so that the objective traverses a straight line across the centre of the preparation. As individual fibres pass the cross hair they are recorded according to their type, mechanical fibres, chemical fibres, etc. The counts may then be converted to percentages and returned as such.

Rapid Estimation

The former method is used for the rapid estimation of fibre content, and as its name implies is simply performed by observing a microscopic field and recording the impression gained of the proportion of different fibres present. This method is said to be accurate to within about five per cent.

This resume of the methods for estimation of fibre content is necessarily very brief, and the reader is recommended to the many works on this subject for further information.

It is the writer's opinion that all laboratories should hold files of permanent microscopical preparations. The object of such a file is several fold. Primarily it keeps available permanent references for purposes of comparison with unknown specimens, affording a rapid means of identifying. It also allows the holding of standard preparations so that further samples of such material may be compared with these stan-

dards for the estimation of quality. It allows the keeping of unusual specimens, i.e. damaged or malformed fibres, and finally, all laboratories must have their quota of new and inexperienced personnel and such a file provides a constant source of information for the training of such personnel.

Generally speaking, a permanent microscopical preparation is made by mounting the specimen to be preserved in a plastic mounting medium, which is then allowed to solidify. The technique is very similar to that for temporary mounts. A number of such mounting agents have been devised (**9**) and there is only room here to deal with a few.

Originally paper workers used the well-known histological mounting agent, Canada balsam. This agent has several disadvantages, the chief of which is the fact that under the influence of light it becomes discoloured and acidic in reaction. The discoloration is a definite drawback, but the development of acidity can lead to the ruination of valuable specimens. One of the earliest suggestions for a substitute was made by Cole (**10**) who used a solution of methyl methacrylate in xylene as a biological mounting agent, and which the writer has found useful for fibres. A more interesting and versatile mountant has been discussed under the name of Clarite. A cycloparaffin resin, this agent was first described by Groat (**11**), who named it Nevillite V. The name was later altered to Clarite, and a subsequent development was named Clarite X.

The Clarites are eminently suitable for the mounting of fibre specimens. They are dissolved in xylene or benzene, and when dry Clarite has a refractive index of 1.544, and Clarite X 1.567, as compared with the refractive index of Canada balsam (1.535). This difference allows greater differentiation of detail. The Clarites have the added advantage of a high melting point as shown below:—

Agent	*M.P. °C*
Canada balsam	61
Clarite	145-155
Clarite X	145-155

This enables the preparation to be used with a microprojector of various specimens, with the assurance that they will not be damaged by the heat.

The technique for the use of these agents is quite simple:—

A slide having been prepared as described at the beginning of this article, and stained by one of the methods outlined, is freed from excess water by gentle blotting with a filter paper, taking care to avoid the fibres themselves. The slide is then dipped into two separate amounts of methylated spirit, and then placed in pure benzyl alcohol for five minutes. It is then drained, and any excess benzyl alcohol wiped off with a soft cloth. Two drops of Clarite or Clarite X are placed on the fibres, and the preparation covered with a clean cover glass taking care to avoid the inclusion of any air bubbles. The slide should then be left undisturbed for 24 hours to set, but it will take at least two weeks to become absolutely hard and permanent.

Mounting Agents

The disadvantage of the foregoing mounting agents is that it is necessary to remove all water from the preparation before they are applied, the presence of water producing cloudiness in the final preparation. Many workers have tried to overcome this need to remove water and several mountants have been devised which do not require this. Bourdon (**12**) devised a polymerised version of polystyrolene which has proved very useful in this respect, but the writer would like to draw particular attention to the polyvinyl alcohol mountant of Huber and Caplin (**13**). Devised originally for use as a purely biological mounting agent, for fungi, etc., it has been found to be of considerable value in the mounting of fibres.

It may be easily prepared as follows:—

15 g. of powdered polyvinyl alcohol is very gradually stirred into 100 ml. of cold water, carefully dispersing any lumps. The solution is then heated to 80°C on a water bath and held at this temperature until of the consistency of treacle. This is the basic solution and may be kept indefinitely until required. When required for use, 56 parts of the basic solution is placed in a beaker, 22 parts of lactic acid added and the mixture stirred for three minutes, and 22 parts melted phenol are stirred in. The reagent is ready for use after five minutes, but should not be kept longer than four hours as it will then be too thick for use.

The technique is quite simple, being identical to that for other plastics media, but omitting the dipping in alcohol. The preparation is simply stained by one of the above methods, well washed in distilled

water, drained, and then mounted in two drops of the reagent.

It is hoped that these few brief notes may prove of interest, and possibly of value to those whom, while not fully engaged in the examination of paper, do come into contact with it from time to time.

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Olive Oil Conference

Benefit to Mediterranean Countries

THE United Nations Conference on Olive Oil, which ended on 17 October, 1955 (see THE CHEMICAL AGE, 1955, **73**, 901 & 962) has concluded an international agreement establishing an Olive Oil Council.

The conference, which met in Geneva from 3 to 17 October, 1955, was attended by delegates from countries representing a wide variety of interests in the olive oil trade. There was representation of both large and small producers, of countries with both large production and import and of non-producing importing countries. An international agreement was concluded, establishing an Olive Oil Council to undertake measures to improve trading conditions.

Of particular interest to the consuming countries is the fact that under the agreement the participating countries specifically undertake not to impose restrictions on the production of olive oil.

Provision was made in the agreement for a publicity programme aimed at increasing consumption of olive oil. For this purpose it is proposed to establish a joint publicity fund and the conference agreed on the basis of contributions to this fund.

The conference also agreed on a set of standard definitions for various classifications of olive oil such as virgin olive oils, pure, refined, and blended. These standards should do much to stabilise conditions in the trade and be of particular value to importers. The conference was concerned to make a positive approach to the improvement of international trade in olive oil and recognised that the establishment of such standards was a necessary first step.

The agreement will be open for signature from 15 November 1955 to 15 February 1956. Those countries which have signed by the latter date will meet before 30 April 1956 as an interim committee for the Olive Oil Council. The interim committee will undertake preparatory work for the first meeting of the Olive Oil Council which will be held about September 1956 provided there has been ratification or acceptance by a sufficient number of the principal producing countries and of consuming countries.

This conference, which should bring particular benefit to the Mediterranean region, was attended by the following countries: Cuba, Dominican Republic, France, Greece, Italy, Libya, Spain, Tunisia, United Kingdom. Observers were present from: Belgium, Canada, Chile, Colombia, Czechoslovakia, Ecuador, Mexico, Netherlands, Portugal, the US and the USSR. The Food and Agriculture Organisation (FAO) and the International Labour Organisation (ILO) were also represented.

At the conference's first meeting, Mr. Henri Janton (France) was elected chairman, and on 13 October 1955, at the request of the French delegation, a separate delegation from Tunisia was admitted to the conference.

Utilising Steel Slag

A MIXING plant for manufacturing asphalt from deposits of steel slag heaps was opened last week by Lord Clydesmuir at Carnbroe, nears Bellshill, Lanarkshire. The unit is a development of Shanks & McEwan Ltd., of Glasgow, and is capable of producing 60 tons of asphalt an hour.

A statement issued by the firm outlines the modern recovery methods giving new values to the slag heaps in Lanarkshire. Using crushing machinery and magnetic separators, steel could be extracted from huge lumps dug or blasted from slag heaps, and it is estimated that 300,000 tons of slag could yield about 25,000 tons of scrap steel. Slag chips and sand remaining after the initial crushing could be processed for use in road, airport, and other surface projects.

The new unit is entirely automatic, needing the supervision of only four men, and can easily be dismantled into three main sections for transportation by road.

Foams in the Production of Sponge Rubbers & Plastics

THE production of foams, being an important factor in the production of cellular products, has accordingly commanded considerable attention and research. Many techniques have therefore been evolved, whereby better quality foams have been prepared. Cellular products not only find applications in the manufacture of cushions, pillows, mattresses, undercarpet padding, etc., but also in the laying of pavement slabs and the production of porous concrete. In the laying of pavement slabs, the foam is poured into spaces between the slabs and coagulated *in situ*. Delayed gelling agents are used in such compositions and may include either aluminium, ammonium or sodium silicofluorides. Low temperature accelerators such as diamyl ammonium dithiocarbamate find useful application in this technique.

Natural & Synthetic Latices

Porous concrete on the other hand is manufactured from aqueous compositions containing high molecular weight polyvinyl alcohols and surface active agents such as the sulphonates fatty acids. These dispersions are aerated. The porosity of the resulting product is associated with the concentration of polymer used and the activity of the surface tension depressant (**1**).

Foamed products have been prepared from frothed mixtures containing natural and synthetic latices. Sponges thus produced may possess valuable properties; for example, those obtained from frothed mixtures of natural and polybutadiene latices have displayed improved odour characteristics (**2**). Frothed mixtures of natural rubber and butadiene-styrene copolymers have also been used. Thus good high compression resistant sponges have been economically produced by adding a resin latex obtained by polymerising a mixture comprising between 80 to 95 per cent of a vinyl aromatic monomer and between 5 to 20 per cent of a conjugated double bond olefine, to a natural rubber latex, the resulting mixture being frothed. A sponge rubber composition made from 351 parts of natural rubber (95 per cent based on the total dry rubber/resin content) and 19.6 parts of resin latex (this made from a copolymer comprising 15 per cent butadiene-1:3 and 85 per cent styrene) gave a sponge product having a compression resistance of 38 lb., the sample having a density of 0.00434 lb. per cu. in. The sponge product also gave a permanent set of 92.8 per cent.

Gelling Agents

Gelling agents mostly used in foaming operations comprise the alkali and ammonium silico-fluorides. Their delayed gelling action depends upon the slow hydrolysis of the alkali salts to free hydrofluorosilicic acid, which supplies the hydrogen ions for coagulation, by neutralising the negative charge on the lyophobic rubber particle. The rate of hydrolysis can be retarded if desired by the introduction of water soluble neutral salts such as potassium and sodium chloride; by the introduction of a soluble salt with a common ion, the ionisation of the silicofluoride is retarded (**3**). Silicofluorides utilised as delayed gelling agents may display certain undesirable properties; this is observed when such gelling agents are introduced as pastes (50 per cent concentration of gelling agent) which can possess an initial *p*H of 3, on application these can cause local gelling. This initial high *p*H may, however, be reduced by the use of soluble fluorides where the released fluoride ions, react with the hydrogen ions extant. Varying amounts of fluoride may be used, this controlling the *p*H required; thus 0.02 M concentration of fluoride ion can raise the *p*H from 3 to 5, while a 0.1 M concentration of fluoride ion brings it to 6.0. 0.4 M solutions gives ranges in the neutral zone (**4**).

Techniques involving rapid cooling of foamed rubber dispersions are important because by virtue of the increase in solution viscosity due to refrigeration, reduction in foam drainage and the time span in sol-gel transformation is effected. The resulting ice foams on immersing in baths of coagulating liquids such as calcium chloride, afford tough continuous films. This method has a useful advantage over techniques using delayed gelling agents, because near the iso-electric point foam strength is at a mini-

mum and the foam may tend to collapse prior to gelling. In frozen foams this phenomenon does not occur. When the ice-foam is immersed in strong solutions of electrolytes, coagulation is effected without damage to the foam structure. On the other hand the stereo-reticulate nature of frozen uncoagulated foams allows the passage of liquid or gaseous coagulants, thus permitting coagulation on the foam at conditions of maximum porosity.

Successful Catalysts

Catalysts such as haemoglobin or catalase have been successfully employed in delayed blowing operations, using peroxides. The applications of such catalysts are best served when blowing is carried out in the mould, so facilitating adequate filling of the latter. Retarding the initial liberation of gas controls the exothermic nature of the blowing reaction, and so permits a uniform expansion in the mould. The desired delayed catalytic activity may be initiated by either a temporary poisoning of the catalyst by formaldehyde or toluene, adsorption of the catalyst to a carrier, or refrigeration of the latex mixture. Yeast appears the most satisfactory method of applying catalase, refrigeration of the latex mixture to around 40°F allowing an ideal induction period for the liberation of oxygen; the cold latex absorbs the heat evolved during the initial decomposition of blowing agent (**5**).

Pile fabrics have been manufactured using foam rubber. The fibres are planted into a foam rubber composition, the latter being applied to a suitable substratum. The utilisation of foam reduces the tendency of the latex to penetrate the backing material. The fibres are incorporated in the foam before the gelling operation is established. In such compositions the dinitrosopolymethylene tetramines are used as blowing agents. These decompose before the gelling temperatures. In order to ensure that the fibres form a suitable pile, the latter are introduced in an electrostatic field, usually of the order of 30,000 volts per sq. cm. Satisfactory foams have an air/latex ratio of 4:1 (**6**).

The porosity of the surface of sponge rubber products formed at the surface of the mould, can be improved by coating the surface of the mould with non-surface-active hydrophilic colloids. Those colloids of interest include the carboxyalkyl celluloses, the polyvinyl alcohols, gelatine and casein, etc. This method is claimed to be superior to that involving the use of soaps at the mould surface, where the surplus amounts of such may cause uneven shrinkage and consequently products with depressions and blotches.

Foams by such a process have been prepared by whipping the latex containing the gelling agent (which may be sodium silicofluoride or a mixture of zinc oxide and ammonium salt) the foam being either gelled on heating or standing. The sponge may then be vulcanised. In such operations the mould surfaces are sprayed with non-surface-active components, their viscosities being such that they find easy application to the surface of the mould. Convenient concentration ranges are shown below for the substance listed (**7**).

	per cent
Sodium polyacrylate	0.5 to 1.5
Ammonium alginate	0.5 to 1.5
Gelatine	0.5 to 3.0
Carboxymethyl cellulose	0.5 to 10.0

Wetting agents are important in the production of suitable foams; apart from their contributions as stabilising and foaming agents, they may also function as delayed gelling auxiliaries. To ensure good foams, builders are often introduced with the wetting agent. Foams having reduced collapsing tendencies have been obtained using zinc soaps, with sodium and ammonium hexametaphosphates as auxiliaries (**8**).

Sodium silicofluoride is incorporated as gelling agent; after gelling of the foam the latter may then be dried and vulcanised in hot air. The production of foam is related to the degree of positive adsorption of the stabiliser as interpreted by the Gibb's adsorption equation $\Gamma = -c/RT\ \delta\gamma/\delta c$. Compounds negatively adsorbed as electrolytes, afford films having high tensiles, which do not readily foam. The efficiency of a wetting agent is broadly related to the nature of its hydrophobic and hydrophilic moities.

Good foam structures have again been procured using cationic surface active agents. These have included the long chained aliphatic quaternary ammonium salts and the alkyl pyridinium halides (**9**). The most suitable reagents are those soluble in mineral oils, particularly those having specific gravities between 0.88 and 0.92. Sol-gel time is reduced because the system is

more sensitive to gelling when such wetting agents are utilised. Foams of superior structures are therefore claimed.

A conceptual basis for the mechanism of this process may be suggested by reference to possible electronic features extant. The rubber particles can absorb about 10 to 12 per cent water; electromeric changes as shown would permit the accumulation of small negative charges on the surface of rubber particles, which being hydrophobic would tend to be spherical in aqueous media, with the partial charges distributed evenly over the surface area. The neutralisation of such partial charges would therefore tend to reduce the resulting charge of the rubber particle, and so render it susceptible to gelling agents. The amount of negative charges neutralised would depend upon the dimensions of rubber particle and the size of the alkali pyridinium aggregate. On such assumptions therefore an increase of alkyl pyridinium cations in the ion atmosphere would ultimately neutralise the charges on the rubber particle.

In practice the amounts of the cationic wetting agent employed are restricted to partial neutralisation of the charges extant. The colloidal aggregate of cetyl pyridinium acetate in aqueous solutions is roughly a sphere with a radius of 23 Å. and containing about 80 cetyl pyridinium ions (**10**). With stronger ions as the chloride, the aggregates may even be larger, and therefore capable of appreciable neutralisation of the partial charges on a given rubber particle.

Sensitivity of Dispersions

The sensitivity of dispersions of natural and synthetic rubbers containing anionic stabilising agents as the long chained alkyl sulphates, by the introduction of polyamines, is probably related in mechanism. In the latter case the amphipathic sulphate is probably an elongated aggregate, whose polar groups tend to be more dispersed than would be the case for a pure hydrophobic particle. Neutralisation of the charges on the anionic wetting agent would reduce its stabilising properties.

As delayed gelling auxiliaries, stabilisers of the polyalkyl ether class have found useful applications. The polyalkyl ether alcohol monofatty esters of the type

$$R.CO.(O.C_2H_4)_n.OH$$

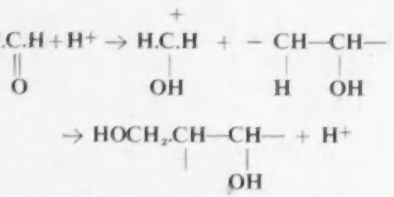
where R may be an aliphatic polymethylene moiety containing between eight to 20 carbons and n of value at least four, have been used in foaming techniques. These useful stabilisers are sold under various trade names, Neutronyx 331 and Emulphol ELA being well known. Such stabilisers function below their flocculating points, above which temperatures they become insoluble and lose their stabilising characteristics.

Speedy Gelling Permitted

The introduction of such stabilisers in foaming compositions, while functioning at the lower operational temperatures, permits speedy gelling of the system above their flocculation temperatures. This serves to reduce the sol-gel time span and so improves the texture of the sponge. The duration of the stability of the latex is related to the quantity of stabiliser utilised. A GRS latex containing six parts of stabiliser based on a 100 parts of dry weight latex was stabilised against gelling for over two days (**11**). The first use of stabilisers as delayed gelling auxiliaries was reported in 1938. Emulphol O was used to stabilise latex against coagulation by acid; anionic wetting agents as sodium alkyl naphthalene sulphonates and the sulphonated higher alcohols may also be used as stabilisers for heat sensitive latices.

Foams have been prepared using wholly or partially hydrolysed polyvinyl acetals. Aldehydes or aldehyde releasing substances, in conjunction with sulphuric acid, are added to the acetal dispersion. After whipping, facilitated by the incorporation of wetting agents, the froth is poured into moulds. The foams gel by virtue of the reaction of the polyvinyl constituent with the aldehyde, the reaction being one probably of cross-linking. In order to obtain good cellular products from such dispersions, the polyvinyl alcohols or their partially hydrolysed acetals, are initially dissolved in aqueous formaldehyde prior to the addition of further quantities of aldehyde.

This technique reduces the amount of acid necessary to catalyse the curing reaction, and in so doing avoids the use of dilute solutions (**12**). The mechanism of curing probably embodies a nucleophilic displacement in the hydroxyalkane moiety, by a carbonium intermediate formed from proton and aldehyde. A newly formed methylol then reacts with adjacent methylenes. A postulation for the mechanism is shown at the top of the next page.



Often gelled foam latices of synthetic rubbers on heating before the vulcanisation stage, tend to lose water from their gelled structure, culminating in foams having fissures and cracks. It appears that such foams may be improved by sequestering the polyvalent zinc ions present and utilising a non-ionic stabilising agent as an alkylated phenyl monoether of polyethylene glycol. The preferred method of foaming consists in whipping the latex containing these ingredients into a foam, and then adding the zinc oxide and fluorosilicates as pastes. Recipes used have incorporated 0.5 to 2.5 parts of fluorosilicate and 1 to 5 parts of zinc oxide to 100 parts of rubber. The sequestering agents, which may include alkali carbonates, borates, metaphosphates and ferrocyanides, etc., are incorporated in amounts between 0.1 to 2 parts per 100 of rubber, the non-ionic stabiliser varying between 0.25 to 3 parts by weight (**13**).

Urea peroxide has found application as a blowing agent in the production of foams, magnesium hydroxide being used as gelling agent; soluble components as glycerol, which are negatively adsorbed as interpreted by the Gibbs adsorption equation, giving higher surface tensions, yield smaller bubbles, while more amphipathic molecules as casein, being positively adsorbed to a greater extent, give larger foams. The applications of such auxiliaries therefore control to some extent the texture of the foams (**14**).

The inclusion of castor oil in a foaming mixture, improves the flexibility of the foam, while the incorporation of paraffin wax gives products with good 'snap' and rebound characteristics. Inorganic constituents as magnesium oxide and calcium silicate serve as stiffening agents (**15**). The introduction of cotton linters into foam rubber recipes affords both an economical expedient and a method of improving tear resistance; their introduction also assures reduction of foam shrinkage during gelation. The amount of cotton liners introduced into the foam mixture is usually somewhere in the order of 3 to 5 per cent of the weight of rubber used.

Good as the synthetic foams may be, their high solid content, incorporated as a result of their methods of preparation, is an undesirable feature and research has been directed to the production of latices containing less non-rubber contents. The slow heat transfer through gelled foam masses often adversely effects the quality of the foam; slight pre-vulcanisation of the latter has been suggested.

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SCI's 75th Annual Meeting

'ACHIEVEMENTS of Industrial Chemistry' is to be the theme of the 75th annual meeting of the Society of Chemical Industry in London next year.

The nature of the lectures will enable speakers to review the major advances brought about by the work of industrial chemists in the last 25 years, and to look forward over the next 25 years to the centenary of the Society.

After a general introduction, there will be two parallel series of lectures, four of each. One series will deal with the products of industrial chemistry, the new processes which have been evolved and perfected, and the advances in fundamental science which made them possible. The other series will survey the tools of industrial chemistry to-day, and cover such subjects as modern manufacturing techniques and the use of metals and non-metals in plant construction.

Canadian Chemical Industry's Best Year

The Canadian chemical industry is having its best year ever. Sales so far this year are showing an increase of nearly 20 per cent above the corresponding period last year and the annual dollar volume is expected to be over $1,000,000,000 for the first time, thus placing the industry among the top industry groups in the country.

Du Pont Expansion

To Start European Agricultural Service

THE use of chemicals in European agriculture has become so important that the Du Pont Company of Wilmington, Delaware, US, is assigning an agricultural service and development specialist to Europe. He is Dr. Linton E. Cowart who will be based in Basle, Switzerland, to work with agricultural experiment stations, farmers, and distributors appointed by Du Pont to handle agricultural chemicals in Western Europe and the British Isles.

Dr. Cowart's appointment extends Du Pont's 30-year tradition of technical service in Europe which began in Paris in 1925 to solve problems and supply technical information on the use of coated fabrics and finishes. Soon afterwards, a similar organisation was started in Brussels to assist the textile industry in using Du Pont dyes and chemicals. Following World War II, this service was extended to the rubber industry with the development of neoprene synthetic rubber and covered Europe and the Near East from headquarters in Basle.

Field Research Supervisor

A leading agricultural scientist in the US, Dr. Cowart studied at Louisiana State University. He graduated in 1948 with a bachelor of science degree in horticulture and agronomy, and in 1951 received his doctor of philosophy degree in botany and plant pathology. Joining Du Pont in 1950 he spent about two years managing two of the company's agricultural field research stations, first at Baton Rouge, Louisiana, and later at Eagle Pass, Texas. In January, 1953, he became a field research supervisor at the company's headquarters in Wilmington.

Chemicals which Du Pont supplies for European agriculture include: 'Karmex' herbicides for agricultural use; 'Marlate' methoxychlor insecticide for control of various insects on livestock, in stored grain, and on forage and vegetable crops; 'Manzate' fungicide for control of diseases of many crops, especially tomatoes and potatoes; 'Fermate' fungicide for grapes, apples, and other fruit; 'Zerlate' fungicide for vegetables; 'Granosan' seed disinfectant for cereals; 'Arasan' seed disinfectant for rice and maize; phenothiazine worm remedy, methionine amino acid for poultry; and 'Delsterol' vitamin D3, a supplement for poultry feed. The company also supplies 'Telvar' weed killers which are used by industry, especially the petroleum and electrical industries and railroads.

First Instrument Show

Wide Range of British & Foreign Exhibits

TOOLS for the Scientist is how the Shandon Scientific Company Ltd., describe the exhibits at their first instrument show which ended on 11 November. This exhibition, held at their head offices at 6 Cromwell Place, London S.W.1, illustrated the range of instruments made or distributed by Shandon.

Among the wide range of balances on show were several automatic scales including the ASE electronic repetition weighing machine which is used for the rapid dispensing of substances to a predetermined weight with an accuracy of ±10mg. and a weighing range from 1 to 100g. Under favourable conditions it is claimed that the rate of weighing can be stepped up to 1,000 per hour without impairing accuracy.

Chromatographic apparatus was well represented. Shandon make one-piece moulded all-glass tanks which they say will meet all requirements in paper chromatography. The Griffin & Tatlock vapour phase chromatograph was also on show. This apparatus, which has been described in this journal before, will analyse a mixture or complex which vapourises between 20 and 200°C.

Electrophoresis apparatus, apparatus for miscroscopy, microtomy and biochemistry were also on show.

Shandon Scientific Company started in 1948 as importers of continental apparatus, becoming instrument manufacturers themselves at a later date. At this first exhibition about one third of the apparatus shown was Shandon's, the remainder being that of well-known British and continental manufacturers. According to Mr. Kendall of the company, Shandon's policy is to market apparatus which they consider to be of a high quality. 'We do not act as general agents for other firms,' said Mr. Kendall. 'Any apparatus, our own or not, which we sell we will service if necessary'.

When asked about delivery dates Mr. Kendall said that most apparatus could be supplied from stock.

Epikote Resin Ester

EXPERIMENTAL work recently carried out by Styrene Co-Polymers Ltd., 1 Roebuck Lane, Sale, Manchester, was primarily an attempt to find a way, by means of styrenation, of reducing the high cost of producing conventional epikote resin esters. Results showed that, in addition to achieving considerable savings in cost, styrenation also conferred improved technical properties.

As a direct result of this work, a new resin named Scopon 1130 has now been put into production. It is a co-polymer of styrene and an epikote resin ester. Styrenation, it is claimed, has resulted in an upgrading of the physical characteristics of the ester in the following respects:—

1—Resistance to gas checking.
2—Retention of film properties under maintained high temperatures.
3—Speed of set on air drying.
4—Water resistance.

The makers recommend Scopon 1130 for stoving and air drying applications where particular resistance is required to chemical attack and where exceptional film toughness and adhesion are required. Washing machine finishes and top quality primers are typical examples.

Stoving finishes based upon this new resin are said to have shown good colour and colour retention. Air drying finishes can be prepared to be touch dry within 20-30 minutes.

Scopon 1130 is compatible with members of the Scopol range of styrenated alkyd resins. It is thought that this new surface coating medium may find particular application as a modifying agent for the Scopol resins when it is desired to upgrade their chemical resistance or other physical properties.

'Enforced Order' Crusher

WE HAVE received the following communication from Dr. M. S. Frenkel concerning the article 'Enforced Order Crusher and Mixer' which appeared in last week's issue of THE CHEMICAL AGE:—

The following features additional to the construction of Figs. 1, 2, 3, 4 of the above article produce an additional crushing effect, which completes the necessary crushing action for many applications, and which may be of particular importance, for example, for crushing single large and hard pieces in a mass of smaller material.

(a) The section (6) of the outer screw which is provided with axial ribs and grooves (Fig. 1) should not be rotated in one direction only, but should have a reciprocating rotation which it transmits to the corresponding section (3) of the inner member.

(b) In accordance with that, provision is made that each axial rib should have a circumferential reciprocating motion in its groove, apart from that in the axial direction. This is done by making the width of grooves considerably larger than the width of ribs in both members, e.g., groove 15 considerably wider than rib 14, and groove 13 considerably wider than rib 12, by the same distance according to the size of pieces to be taken up and crushed.

This reciprocating circumferential crushing effect provides considerable additional reciprocating crushing in three mutually normal directions. That is, the crushing forces are in all directions round the circumference between the grooves and the ribs and act alternately on opposite sides of a groove owing to the reciprocating rotation, and apart from that these crushing effects are not stationary in the axial direction, but reciprocate axially with the axial reciprocating motion of the inner member.

The rotary reciprocating secton (3) of the inner member carrying the axial ribs and grooves may be separately rotatable from the adjoining sections 2 and 4, which latter may be rotated for example by the method explained in the above article.

Canadian Amalgamation

William J. Michaud Co., Montreal, and British Chrome & Chemicals (Canada) Ltd., Toronto, are to amalgamate, but will continue to operate as separate identities with head offices at 321 Bloor Street W., Toronto. William J. Michaud Co. offices will be at 4795 St. Catherine Street W., Montreal. The enlarged organisation in Canada, together with overseas connections will provide greater scope for sale of chrome chemicals and heavy chemicals in general.

Indian Essential Oils

India exports essential oils and essential oil-bearing seeds of an estimated value of Rs.200,000,000 annually.

Fibre-Reinforced Plastics

New Corrosion-Resistant Compound

IMPORTANT new development in the field of corrosion-resisting compounds is the production of a fibre-reinforced plastics material which can be applied by brush on metal surfaces as an effective and economical protection against the corrosive effects of aggressive atmospheres, sea water, hydrocarbon products and a wide range of chemical agents, both in gaseous and liquid form.

The material, which may be of interest to those concerned with the maintenance of oil refineries, chemical processing plant and structural steelwork, consists of a mixture of a synthetic resin or latex with high-alumina cement, the whole being reinforced with a tough woven fabric by a patented process.

It is applied in two layers, interspersed with the woven fabric, to a total thickness of about 3/32 in. It is cold setting, and the weight of the complete coating is approximately 9 lb. per sq. yard. Very little preparatory treatment is required—which is a great advantage of this technique. It is sufficient to remove loose scale and rust by wire brush, and the presence of moisture does not impair the effectiveness of the application.

Because of the toughness of the layer produced, this 'VG Compound' is likely to be particularly applicable for structures composed of thin sheeting, since it will afford strength as well as corrosion protection.

The compound is said to be impermeable and yet flexible, to show no softening at elevated temperatures and to have a particularly good impact strength, comparing favourably in this respect with standard concrete.

Extensive initial tests have confirmed the applicability of this material in shipyards, and in oil refineries in this country and in France, in gas producing plants and also in sewage treatment works. One department of the Ministry of Works has reported very good results for containers coated with the compound and subjected to the corrosive action of formalin, and there are many other fields of application which are likely to be developed in the near future.

The 'VG Compound' has been produced by VG (London) Ltd., of 5-6 Newman Passage, Oxford Street W.1, who can carry out large-scale site applications as required.

C

Automation Display

THE Solartron Electronic Group Ltd., of Thames Ditton, Surrey, entered Fleet Street, London, on 3 November, when they gave an equipment demonstration in automation technology to the Press at Ye Olde Cock Tavern.

During September and the early part of October two teams of Solartron specialists toured the US on an export and goodwill mission, and to man the only British stand at the Instrument Society of America's 10th Annual Instrument-Automation Conference and Exhibition in Los Angeles. Determined to capture a market in the US the company's team studied US sales methods.

These methods were discussed at the demonstration where a spokesman for the company told THE CHEMICAL AGE that plans were advanced for the formation of an American company by next June. 'We believe,' he said, 'that the days of trade secrets have gone. It breeds lethargy and lack of competition.'

Solartron introduced some of the equipment they showed in Los Angeles, including the transfer function analyser which is designed to test two servo-mechanisms under conditions where the servo output may be non-linear. Costing about £1,200, one has been installed in the servo-laboratory at the new Birmingham Technical College which was opened by HM The Queen that same day.

Plastics Exports Near Record

EXPORTS of British plastics raw materials in 1955 are expected to be a record. Figures for the first nine months of this year at 62,000 tons, valued at nearly £16,800,000, shows an increase of 12,000 tons over the corresponding period last year. If the present trend is maintained, 1954's record value of over £20,000,000 should be exceeded by about £2,000,000.

The chief raw materials exported include synthetic resins, moulding powders, sheet, rod, tube, film and foil, but not finished products or plastics materials incorporated in other finished products, such as cars and radios. Biggest buyer is Australia (£2,400,000), followed by South Africa, India, New Zealand, Holland, and Sweden, with about £1,000,000 each.

Radio-Active Isotopes

Paper Presented at BIM Conference

'ALREADY it is estimated that some millions of pounds per annum are saved in this country by the use of radio-active techniques. It has been estimated that $100,000,000 are saved annually in the US through their use.' These figures were quoted by Mr. J. L. Putman of the UK Atomic Energy Authority in a paper presented to the British Institute of Management's National Conference at Harrogate, on 2-4 November.

'It is perhaps unfortunate,' said Mr Putman, 'that nuclear science has so far intruded into industrial processes that management should have to concern itself with details of atomic physics. The use of radio-active materials has become so widespread that few branches of industry can afford to neglect their potentialities.' In the course of his paper he explained for the benefit of managers how it was that certain materials became radio-active.

Used to Gauge Thickness

Among other uses of radio-activity, Mr. Putman indicated how the measurement of the degree of penetration of radiations could be used to gauge thickness in the production of sheet materials such as paper, plastics, foils and rolled metal sheets. Such gauges were even used to control the packing of tobacco in cigarettes. The responses of certain types of gauge could readily be made to operate switches to control thicknesses automatically. This method had been shown to result in more uniform products than could be obtained by manual control.

Using similar gauges the absorption of radiation by the contents of a package or a liquid container was used to check the level of filling. Radiations were chosen which would penetrate the walls of the package or tube, but not the contents when the container was filled above a certain level. 'It may be worth remarking,' said Mr. Putman, 'that the products measured are in no detectable way affected by the radiations. I should like to make it specially clear that they do not become radio active.'

'British industry was at first rather slow to adopt radio-active techniques and their early development was largely at the instigation of smaller firms who had "nothing to lose." In view of the great economic advantages which are already being reaped by our competitors in the US and other countries (notably the USSR) by the use of these methods, it is hoped that we shall no longer hesitate to adopt them.'

Fireproof Hydraulic Fluid

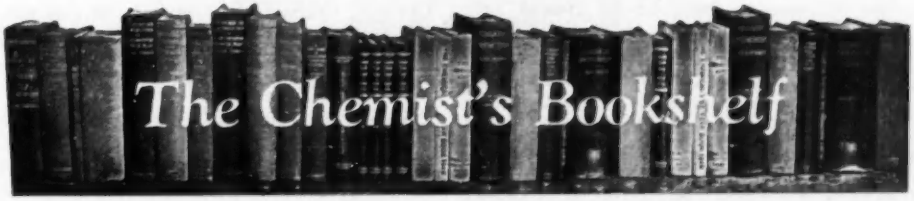
SHELL FR hydraulic fluid, a new material combining fire resistant properties with good hydraulic characteristics, is now available in the United Kingdom and the Republic of Ireland. It has been designed to meet the need for a fire resistant hydraulic fluid, particularly in the case of die-casting machines and other equipment handling material at temperatures high enough to cause ignition of mineral oils on leakage.

The fluid has been subjected to exhaustive tests and has displayed many properties. In spray inflammability tests, a fine spray of the fluid, when directed at the flame of an oxy-acetylene torch, either failed to ignite or, if ignition occurred, the flame died immediately the torch was extinguished. During a contact inflammability test the fluid rolled off in globules or volatilised without firing when dropped on to a steel pipe heated to 1,200°F. In a direct flame test an asbestos wick, soaked in fluid and suspended over a lighted Bunsen burner, either failed to fire or when ignition took place, the flame died immediately the burner was removed.

Apart from its fire-resistant properties, Shell FR hydraulic fluid has exceptional lubricating and hydraulic qualities. Tests on the four-ball machine have shown that its load carrying properties are equivalent to those of typical hydraulic oils of similar viscosities. The fluid has shown exceptional stability and should, under normal conditions, remain fit for service for virtually an indefinite period, provided contamination is avoided. Dyed green for ready identification, its specific gravity at 60°F is 1.35.

West German Potash Development

The West German potash industry and the sales organisation of the West German potash mines have jointly established a new company, Kali-Union Verwaltungsgesellschaft with a capital of DM.500,000, to deal with home and foreign firms and organisations engaged in the production and sales of potash, other fertilisers and their by-products.



CHEMISTRY OF THE SOLID STATE. Edited by W. E. Garner, C.B.E. Butterworths Scientific Publications, London. 1955. Pp. viii + 417. 50s.

This volume gives a survey of a number of topics concerned with the physics and chemistry of the solid state presented in such a way as to be extremely useful for physical chemists. Two features call for special mention—the wide scope which the volume covers and the high quality of the contributions. However, it is inevitable when so much ground is covered in so little space that, in parts, the treatment will be found to be rather too concise. Nevertheless the appropriate references are included at the end of each chapter and it should not be difficult for a person, unfamiliar with the background of any topic, to read up the relevant literature.

The fundamental aspects of the subject are set out in the first seven chapters covering crystal dislocations, lattice defects in ionic crystals, action of light, surfaces, semiconductivity and magnetochemistry, crystal nucleation and finally the clarification and theory of solid reactions. These seven chapters together occupy a total of just over 200 pages and they are followed by a further eight chapters in which the fundamental principles are applied to a variety of topics such as the kinetics of endothermic and exothermic reactions, the photographic process, the oxidation of metals, etc.

A pleasant feature is the number of cross references from one chapter to another and this, together with the arrangement of the subject matter, imparts a sense of integration to what might otherwise appear to be a series of individual topics. The volume is provided with a useful subject index and also an author index in addition to lists of references at the end of each chapter. Unfortunately some confusion may arise from the author index because surnames only are given and consequently entries such as 'Smith" and 'Taylor' refer to more than one person.

The volume should prove to be a most useful work of references to all whose researches bear on the chemistry of the solid state.—C. KEMBALL.

NEW METHODS IN ANALYTICAL CHEMISTRY. By R. Belcher & C. L. Wilson. Chapman & Hall, London. 1955. Pp. xii + 287. 30s.

When one reads the announcement of the publication of a new book on analytical chemistry, it is assumed, generally, that such a book cannot be modern unless it carries chapters on chromatography, photometry, etc. Such is the state of analytical chemistry nowadays, that the average student or analyst cannot think of analysis without an instrument. However, on closer investigation, it will be discovered that, in industry and research, despite the enormous publicity given to, and the popularity of instrumental methods of analysis, the main bulk of work is still carried (and indeed, in some cases, they are perhaps the only methods) by the classical analytical procedures of separation, precipitation and titrimetry.

Although lacking the publicity of the newer instrumental techniques, nevertheless, very considerable improvement and advance has been made in classical procedures since 1938. The literature covering developments in this field is enormous, scattered and until the publication of this volume not collected together under one cover. In this sense, therefore, the authors have done something very new and something of very great value. They have assembled in one volume a great variety of new and not-so-new, but well-tested, methods based on classical procedures.

Parts of this book may be familiar to some, but all of it will be familiar to few, if any. It is, therefore, a book which contains something of value for all, student, analytical specialist and research worker. Since this is a first publication the contents

and arrangement will be of considerable interest.

In a book of seven chapters, the first, entitled, 'Separation by Precipitation', lays emphasis on those methods where an ion is separated in a form which can be further treated gravimetrically or titrimetrically, or where an interfering ion is removed prior to the determination of another ion. Well-known precipitants are discussed alongside the more novel. Of these novel methods of precipitation the most interesting is perhaps, 'precipitation in homogeneous solution'.

This section is followed by, 'Separation by Extraction', and in chapters three and four inorganic (multipurpose and selective) and organic precipitants respectively are detailed, in all cases from the point of view where the reagent produces a precipitate of suitable weighing form. From gravimetric analysis the interest moves to indicators and titrants in two subsequent chapters. The whole field of indicators, acid-base, redox, iodometric, adsorption and miscellaneous are covered and among the new titrants ethylenediaminetetra-acetic acid finds a place.

The final chapter contains 'Miscellaneous Methods' and a variety of constituents are determined either titrimetrically or gravimetrically. Included is the very recent method for potassium using tetraphenylboron.

A very worthy feature of this publication is the attempted uniform mode of presentation, always a rather difficult task in books on analytical chemistry. Previous methods and the important properties of the reagent are first referred to where relevant. This is followed by the compound formed or the reaction involved where known. Optimum conditions, interfering ions and the treatment of the product are next discussed. Finally, the recommended, detailed procedure is given.

Literature references are listed sectionally and a very wide range has been covered in a thorough fashion.

No typographical errors have been found by the reviewer and the book is in all senses well-produced and edited. It should find a place among the teaching manuals in universities and will be a valuable asset to the analyst or the research worker looking for a straightforward method for the determination of an inorganic constituent which excludes the use of an expensive instrument. —R. J. MAGEE.

ORGANIC CHEMISTRY. By Julius Schmidt. Revised and edited by Neil Campbell. Oliver & Boyd, London & Edinburgh. 1955. Pp. xi + 936. 35s.

Textbooks of organic chemistry for advanced students mostly all cover the same essential ground but vary in placing different weight on different sections and aspects. It is therefore difficult for a multi-edition work such as Schmidt to adjust itself in each successive edition during the last 30 years to the current trend. Nevertheless it is abundantly clear that success has been achieved in striking just the right balance. There is no excessive dwelling on any one aspect to the detriment of the rest.

The integration of new material with the old has been very skilfully done but through the occasional cracks one cannot help catching glimpses of out-dated items and traces of the older approach. For example, the table of types of isomerism on page 60 is unchanged from that in the first edition used by this reviewer as a student. It includes the term 'metamerism' now barely understood and the older definition of polymerism. On the next page there is mention of Thorpe's 'normal form' of glutaconic acid, long since rejected. In the 100 page general section under 'Physical Properties' the treatment of colour, dealing mainly with Witt's theory, is separated by many pages from that of the absorption of ultraviolet and infrared light obviously added subsequently.

The attempt to limit size and yet to have complete coverage has led to many sections becoming scrappy. This is counterbalanced by one admirable feature, namely the numerous references to original work and to monographs. Here again, however, older items should be discarded and newer introduced, for example, under 'Resonance' books by Watson and by Hammett are recommended but not the later and authoritative volume of Wheland. Additional and more attractively set-up structural formuae would be an improvement. The only error noted was the ascription twice of the centric formula for benzene to Armstrong and Bamberger instead of to Armstrong and Baeyer.

Without doubt this is just the right book for the advanced student who needs a reliable, readable, modern and complete guide to the subject.—M.C.

HOME

New Address

British Titan Products Co. Ltd. have moved to new offices at Adelphi, John Adam Street, London W.C.2. Tel.: TRAfalgar 4451.

Continental Textile Lecture

Mr. J. R. Whinfield, C.B.E., M.A., F.R.I.C., F.T.I. (Hon), will deliver the first formal lecture to be given on the Continent under the auspices of the Textile Institute at the Swiss Federal Institute of Technology, Zurich, on Friday, 25 November, at 6 p.m.

Battersea Polytechnic Lectures

Starting 10 January, the Chemistry Department of Battersea Polytechnic will hold a course of 10 lectures on 'An Introduction to Some Uses of Radiactive Isotopes'. Fee for the course is £1. Lectures will be held on successive Tuesdays from 7-9 p.m.

Joins British Glues & Chemicals

Sir Miles Thomas, chairman of BOAC since 1949, has joined the board of British Glues & Chemicals. From 1940 to 1947 he was vice-chairman and managing director of Morris Motors.

Electric Arc Furnace

Samuel Fox & Co. Ltd., associated with The United Steel Companies Ltd., are to build a second large electric arc furnace at their Stocksbridge works. The new furnace, which will be similar to the present furnace, installed last November, and now tapping 70 tons, will incorporate modifications shown desirable from experienced gained from the first furnace. Total cost of these developments to increase output of alloy and special steels will be £2,845,000.

Royal Society of Arts Programme

On Monday, 21 November, Mr. A. H. Cook, D.Sc., F.R.I.C., F.R.S., will give the first of three Cantor Lectures on 'The Science of Brewing' to be held on successive Mondays at 6 p.m. at the Royal Society of Arts, John Adam Street, Adelphi, London W.C.2. In the Society's Rooms on 23 November at 2.30 p.m., Dr. B. K. Blount, M.A., B.Sc., D.Phil., F.R.I.C, deputy secretary of the Department of Scientific & Industrial Research, will deliver the E. Frankland Armstrong Memorial Lecture 'Research in Industry'.

D

Paper Coating Emulsion Plant

The National Cash Register Co. are building a plant at Boreham Wood, Herts, to produce a special emulsion for coating paper for 'no carbon' duplicating stationery.

British Nuclear Energy Conference

The inaugural meeting of the British Nuclear Energy Conference at the Institution of Civil Engineers, Great George Street, London S.W.1, on 30 November, from 2.15 to 8.15 p.m., will take the form of a lecture symposium. The meeting will be opened by Sir Christopher Hinton, M.A., M.I.Chem.E., F.R.S., and Sir John Cockroft, K.C.B., F.Inst.P., F.R.S., will discuss the UK Atomic Energy Project. Three papers which are to be presented will be followed by a discussion. Advance copies of the papers are not available.

Government Given Information

Having decided at the present time to abandon the project for mining the 350,000,000 tons of potassium chloride which drilling operations established in North-east Yorkshire, Fisons Ltd., largest consumers of potash in Great Britain, are giving all the technical information they compiled about the deposits to the Government.

Report on Low-Temperature Conference

Aspects of the recent Paris conference on low-temperature relating to metals will be discussed at a meeting of the Institute of Metals at 4 Grosvenor Gardens, London S.W.1, at 6.30 p.m. on 7 December. After an introduction by Sir Francis Simon, Dr. P. L. Smith and Dr. H. M. Rosenberg will make individual reports on the Paris conference.

Chemical Club AGM

At the annual general meeting of the Chemical Club held at 2 Whitehall Court, London S.W.1, on 31 October, Dr. E. H. T. Hoblyn was elected president in succession to Mr. F. E. Warner. Dr. S. H. Bell was elected chairman of the executive committee, succeeding Dr. Hoblyn, and C. Frenkel and F. E. Warner were elected to the committee. Dr. J. Hoy Robertson, hon. secretary, and Dr. Trevor A. Smith, hon. treasurer, were re-elected.

OVERSEAS

Krupps to Build Nitrogen Plant

At the annual general meeting of the Krupp-owned Hannover-Hannibal collieries on 4 November in Essen, it was announced that Krupps are building a £1,800,000 nitrogen plant to be completed in 18 months.

New Synthetic Rubber

At a recent meeting of the American Chemical Society in Philadelphia, chemists of the Goodrich-Gulf Chemical Co., and the Firestone Tyre & Rubber Co. claimed that they have conducted successful tests on a synthetic rubber which should make the US independent of crude rubber imports. Dr. Frank K. Schoenfield, vice-president in charge of Goodrich research, described the material as superior to natural rubber in resistance to attack by oxygen and heat.

Norsk Hydro's 50th Anniversary

Norsk Hydro, the Norwegian industrial concern which produces heavy water for atomic plants and also a large range of chemicals, celebrates its 50th anniversary next month. Started with a capital of £375,000, it now has assets totalling £43,600,000.

Petrobas Oil Plans

Petrobas, the Brazilian Government oil corporation, is to start exploiting newly found oil deposits in the Amazon River basin. Drilling will begin soon for a second well in the Nueva Olinda field.

US Chemical Sales Up

Sales of US chemical companies for the first nine months of this year have maintained a record level of activity. E.I. du Pont de Nemours & Co., report record sales totalling $1,418,000,000, an increase of 15 per cent over the corresponding period of 1954. The Allied Chemical & Dye Corporation's earnings for the first nine months were also a record at $23,400,000, being 23.4 per cent higher than in the same period last year. Olin Mathieson report a 19 per cent increase over last year at $32,500,000. Monsanto Chemical Co. and its subsidiaries also report record sales and earnings for the first nine months, net income at $23,600,000 being 41.8 per cent higher than in the same period in 1954.

Reactor Awaits Approval

The energy-producing atomic reactor to be built at Halden, South Norway, to supply steam to Saugbrugsforeningen, a pulp and paper plant, could be in operation by 1957 if Parliament gives its approval, says Dr. Odd Dahl, leader of the project.

Rum Jungle Copper

A step forward in the development of the Rum Jungle uranium field in the Northern Territory was marked last week with the first shipment from Darwin of copper concentrate, a valuable by-product mined on the field. A shipment of more than 400 tons is going to Port Kebla, NSW, where it will be processed into copper.

Canadian Branch

Glue and Gelatine Works, of Delft, Holland, will establish a Canadian branch in Trenton, Ontario, Mr. W. M. Nickle, Ontario Minister of Planning and Development, announced recently. Operation is planned on three shifts for production of edible and technical gelatin used mainly by food, photographic and pharmaceutical industries.

Cobalt Find in Australia

A new source of cobalt ore in Australia has been discovered by diamond drilling at Mungana in North Queensland. Radio Australia's correspondent at Cairns says it is estimated that the new field contains 1,000,000 tons of cobalt ore. It was found near the abandoned Red Cap mine, which at one time was the main supplier of ore to smelters built at Chillagoe by the Queensland Government.

Japan Buys Jordan Phosphates

A Japanese economic mission has signed an agreement in Amman for the purchase of 150,000 tons of phosphates from Jordan.

Federal Aid Sought

If the Canadian Federal Government would contribute financially to electric power development in New Brunswick, the province could secure the establishment of a $125,000,000 chemical and ore processing plant in the Bathurst mining district, said Mr. Hugh Fleming, Premier of New Brunswick, at a hearing of the Royal Commission on Canada's Economic Prospects.

· PERSONAL ·

MR. PHILIP A. SINGLETON has resigned from the board of Monsanto Chemicals Ltd. to take up a new appointment with Monsanto Chemical Co., St. Louis, US. At the same time it announced that MR. D. R. MACKIE, commercial director, has been appointed acting managing director of Monsanto Chemicals Ltd. Mr. Singleton, managing director of Monsanto Chemicals Ltd. since October 1952, is taking up his new appointment immediately. Mr. Mackie joined Monsanto in 1924. He became sales manager in 1942, was appointed to the board of directors in November 1952 and in December 1953 became commercial director of the company.

MR. JOHN SHIRREFF has been appointed vice-president of Johnson Matthey & Mallory Ltd., the Canadian associate of Johnson, Matthey & Co. Ltd. Mr. Shirreff joined the parent company in 1927 and was employed in the platinum department at Hatton Garden until September 1939. He resumed his duties in the platinum department in 1945. In 1949 he left to join the Canadian associate, since which time he has been principally concerned with the sales in Canada of the company's industrial products.

DR. D. G. HOPKINS, B.Sc., Ph.D., A.R.C.S., a joint managing director of I.C.I. paints division, retired on Monday, 31 October, after 33 years' service. Dr. Hopkins, educated in Swansea at the Municipal Secondary School and Technical College, was afterwards a Royal Scholar at the Imperial College of Science, London. During the 1914-18 war he served with the Royal Engineers, and in 1916 he joined I.C.I. as a plant superintendent at the Pembrey (South Wales) works of Nobels Explosives Co., Ltd. When this works closed in 1919, he took an appointment as lecturer in chemistry at the University of Wales. From 1922 to 1925 he was a research assistant to the Professor of Physical Chemistry at the University of Bristol. He then returned to Nobel Division of I.C.I., first as a research chemist and later as a member of the technical department. He was temporarily seconded in 1928 to the Slough works of Naylor Bros. (London), Ltd. one of the predecessor companies of Paints Division. During his 27 years with the paints division of I.C.I., Dr. Hopkins in turn served as Slough works manager, assistant technical manager, division supply manager, production director and since 1 January, 1949, as a joint managing director.

MR. JOHN C. HAMILTON has been appointed works manager for Canadian Resins & Chemicals Ltd., plants at Shawinigan Falls and Ste. Therese, Quebec. Mr. Hamilton, general superintendent of the plants since December, 1953, joined the company in 1943.

DR. ROBERT BURNS, Ph.D., A.R.T.C., formerly chief chemist of the I.C.I. Nobel Division analytical laboratories at Ardeer, who retired on 31 October received presentations from DR. JAMES TAYLOR, M.B.E., Ph.D., D.Sc., F.Inst.P., on behalf of the company, and from MR. R. C. PAYN, M.Sc., on behalf of colleagues in the research department.

In recognition for long and valuable services given to the Textile Institute, MR. FRED. SCHOLEFIELD, M.Sc., F.R.I.C., F.T.I., F.S.D.C., has been elected by the Council of the Textile Institute to be an honorary life member of the Institute. Mr. Scholefield, a member of the Institute since 1926, has been a member of the examinations board for just a quarter of a century. He became its chairman in 1938, a position from which he has resigned this year.

MR. J. C. STEER has been appointed secretary of Quickfit & Quartz Ltd., manufacturers of interchangeable laboratory glassware, and a member of the Triplex group of companies. Mr. Steer, formerly works secretary, succeeds MR. J. D. NUTTALL, secretary of the parent company, who has joined the Triplex board.

The Royal Swedish Academy of Technical Sciences (IVA), has conferred its highest distinction, the IVA Grand Gold Medal, on DR. K. H. GUSTAVSON, of the Swedish Tanning Research Institute, Stockholm, in recognition of his pioneering contributions

to the chemistry and reactivity of collagen, and for his investigations of the mechanism of tannage, particularly his research on the reaction of chromium compounds with hide protein in chrome tanning. Dr. Gustavson is president of the International Union of Leather Chemists' Societies.

To obtain information on conditions in some South American markets, MR. RODNEY KENT, sales director of George Kent Ltd., left by air on 6 November to visit Kent agencies and principal customers, including the oil industry and many municipalities, in Brazil, Uruguay, Argentina, Venezuela, Cuba and Mexico. In Argentina, he will, as a director of Agar, Cross & Co. Ltd., London, New York and Buenos Aires, work in association with the Agar Cross head offices in Buenos Aires.

MR. HARLEY M. ROSS has been appointed manager of gas operations of the Carbide & Carbon Chemicals Co., a division of Union Carbide & Carbon Corp. Mr. Ross joined Union Carbide in 1923 as an engineer after graduation from the University of Illinois where he received the degree of Bachelor of Science in Mechanical Engineering. Another new appointment is that of MR. K. H. ROWLAND to works manager of Carbide & Carbon Chemicals Co. Mr. Rowland joined Carbide's South Charleston, W. Va., plant as a chemical engineer in 1934, after graduating from the University of Michigan where he received the degree of Bachelor of Science in Chemical Engineering.

Obituary

MR. R. L. POTTER, who died suddenly at his home at Welling, Kent, aged 56, from coronary thrombosis on 25 October, joined the staff of Elliott Brothers (London) Ltd., manufacturers of process control and electronic equipment, in March, 1923, after leaving Loughborough College. Until 1930 he worked in the test room and joined the heat control division when it was formed later that year. At the time of his death he was divisional sales manager.

Nobel Prizes for the US

THIS year's Nobel Prizes in chemistry and Physics have been awarded to three American scientists. The prize for chemistry will go to Professor Vincent de Vigneaud of Cornell University; that for physics will be shared by Professor W. E. Lamb, of Stanford University; and Professor P. Kusch, of Columbia University. The awards, which amount to £13,600, will be made by King Gustav VI Adolf on 10 December.

Professor de Vigneaud has been honoured for his work on the synthesis of hormones secreted by the pituitary gland. The incentive to his work appears to have been provided by ignorance of the way insulin might act, says the citation. This led him to study a particular chemical bond consisting of a pair of sulphur atoms, and to the synthesis of oxytocin.

Royal Society Medals

THE PRESIDENT and the Council of the Royal Society have announced that the Davy medal has been awarded to Professor H. W. Melville, F.R.S., F.R.S.E., D.Sc., Ph.D., M.Sc., Mason Professor of Chemistry in the University of Birmingham, for his work in physical chemistry.

The Hughes Medal has been awarded to Professor H. S. W. Massey, F.R.S., Ph.D., M.Sc., Quain Professor of Physics at University College in the University of London, for his contributions to atomic and molecular physics, particularly in regard to collisions involving the production and recombination of ions.

'Fine Chemicals' Premiere

PREMIERE of a film 'Fine Chemicals for Medical Use' was shown on 1 November at the British Council Theatre. This film was made by May & Baker Ltd., of Dagenham, and illustrates some of the methods used by the company in the manufacture of fine chemical products.

Medical, pharmaceutical and nursing students are the principal audiences anticipated, and, say the company, this film may serve as a substitute for actual works visits, of which only a limited number can be arranged.

The film, which is in colour with sound and runs for 19 minutes, shows the various stages in the manufacture of a drug from research to large-scale production.

Arrangements for showing to suitable groups will be made on application to May & Baker, either in this country or at one of the overseas branch offices.

Publications & Announcements

'PHOTOSYNTHESIS,' and 'Germanium and Its Uses' are two of the subjects discussed in the latest edition of *Endeavour*. This issue completes Volume XIV and binding cases are now available. An index for the year is also included in the issue. Many of the earlier editions of *Endeavour* are now out of print but a limited number of copies of issues Nos. 2, 3, 4, 5, 22, 23, 24, 30, 31, 46, and 47 are still available on request. Copies of some early issues of the French, German and Spanish editions are also available. Inquiries should be made to, *Endeavour*, North Block, Thames House, Millbank, London S.W.1.

* * *

'TRANSACTIONS of the Institute of Metal Finishing' vol. 30, has recently been published by the Institute at 32 Great Ormond Street, London W.C.1, price 63s. to non-members. Papers in this volume include: 'The Development of Organic Bright Nickel Deposits' by J. Edwards, 'Ion Exchange Materials in the Metallurgical Industries' by T. R. E. Kressmam, 'Phosphating' by R. F. Drysdale and 'The Use of Silicone Resins in Protective Coatings' by T. W. Watson. In his presidential address Dr. J. W. Cuthbertson spoke on 'Education and Research in the Metal Finishing Industry'. He said that the importance of education and research was not always sufficiently appreciated and was in some cases, he feared, considerably underestimated.

* * *

INCLUDED in the November issue of *Edgar Allen News*, the journal of Edgar Allen & Co. Ltd., Imperial Steel Works, Sheffield 9, is an account of dust separation in the chemical industry. Virtually all effective processes, says the article, make use of centrifugal action as a means of eliminating material that is oversize. There are two types of air separators, those employing counteraction and those employing deflection. Diagrams are reproduced of the 'Stag' and 'Rema' air separators. Brief mention is also made in this issue of some recent exports of equipment to the Indian market. This equipment includes a rotary kiln for producing caustic soda, another larger kiln for burning calcium carbonate, and three rotary drying plants for handling 30 tons per hour of ammonium sulphate.

CASEHARDENING of steel by the carbonitridng process is described in a pamphlet published by Wild-Barfield Electric Furnaces Ltd., Otterspool Way, Watford By-Pass, Watford, Herts. This process involves the simultaneous introduction of carbon and nitrogen from a suitable atmosphere. The atmosphere can either be prepared in a separate unit and fed to the furnace, or it can be prepared *in situ* by the drip feed method. In one Wild-Barfield method the gases used are raw town gas and ammonia. For the drip feed method Wild-Barfield have developed a material known as Carbodrip, which on pyrolysis gives the same carburising atmosphere as the 'prepared town gas' process.

* * *

CYCLIC gas making processes offered to the gas making industry by the Power-Gas Corporation are described in a brochure published by the company at Stockton-on-Tees. The processes include: carburetted water gas plant, which will gasify coke or coal using gas oil or heavy oil as an enrichment; blue water gas process which uses the same plant as above but dispenses with the use of oil; complete gasificaton plant to gasify coal with or without gas oil or heavy oil as enrichment; high BThU oil gas plant to crack gas oil or heavy oil for production of gas of high calorific value; and Segas catalytic oil gas plant to crack gas oil or heavy oil catalytically or to reform hydrocarbon gas to town gas. Included in the brochure are many photographs and diagrams of the various processes and plants.

* * *

IN the section 'Abstracts from Recent Literature' in the September *Bulletin of the British Whiting Research Laboratories* published by the Research Council of the British Whiting Federation is contained information describing the uses of whiting and brief details of improvements in or relating to devices for the extraction of dust from gases. The section covers a wide range of recently published works on subjects including engineering, manufacture and machinery, particle size and surface area, fillers and powers, chemistry and physics, paint and paint testing. The booklet can be obtained by non-members of the Federation, price 1s., from The Hall, Welwyn, Herts.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

ELDERS WALKER & CO. LTD., Gateshead, paint manufacturers, etc.—7 October, £15,000 (not ex.) agreement and charge, to Harrisons & Crosfield Ltd.; charged on hire maintenance agreements as specified in schedule and benefit thereof, etc. *£39,558. 2 August, 1955.

NORMAN, SMEE & DODWELL LTD., Mitcham, paint manufacturers, etc.—12 October, £11,000 equitable mortgage, to Hygienic Ware Works Ltd.; charged on factory premises at Miles Lane, Mitcham. *Nil. 13 October, 1954.

Company News

F. W. Berk & Co. Ltd.

Regarding the issue of 1,920,000 ordinary shares of 5s. each at 6s. 3d. per share, it is announced that the ordinary shareholders have accepted the Rights Offer to the extent of over 99½ per cent. Applicants for up to 20 additional shares receive allotment in full while those applicants for larger numbers of shares receive allotment on the following basis: Up to 250 shares (20), 260 to 4,000 (25), 5,000 and over (30).

Albright & Wilson Ltd.

At an extraordinary general meeting to be held at Oldbury, Birmingham, at 12 a.m. on 28 November, the company will consider a resolution that the capital of the company be increased to £9,000,000 by the creation of 6,084,852 ordinary shares of 5s. each and 1,978,787 unclassified shares of £1 each.

Laporte Industries Limited

At a board meeting of Laporte Industries Ltd. held on 25 October it was resolved to pay on 1 December 1955 an interim dividend on the issued ordinary stock of the company of five per cent—five actual, less income tax, in respect of the year ending 31 March 1956 to all stockholders whose names appear on the ordinary stock register of the company at the close of business on 24 October 1955.

Anglo-Lautaro Nitrate Corp.

Mr. H. F. Guggenheim, chairman of Anglo-Lautaro Nitrate Corp., has announced that an application has been made to the Export-Import Bank for loans to finance the dollar expenditures of a programme of capital additions and improvements totalling $14,000,000. The programme includes mine and rail extensions, solar evaporation facilities and general plant rehabilitation expenditures. Within five years, conditions permitting, it is intended to carry out further capital additions and improvements totalling $25,000,000. The corporation's application for the $14,000,000 is contingent upon ratification by the Chilean Congress of the referendum agreement concluded between the Government and the nitrate producers last December.

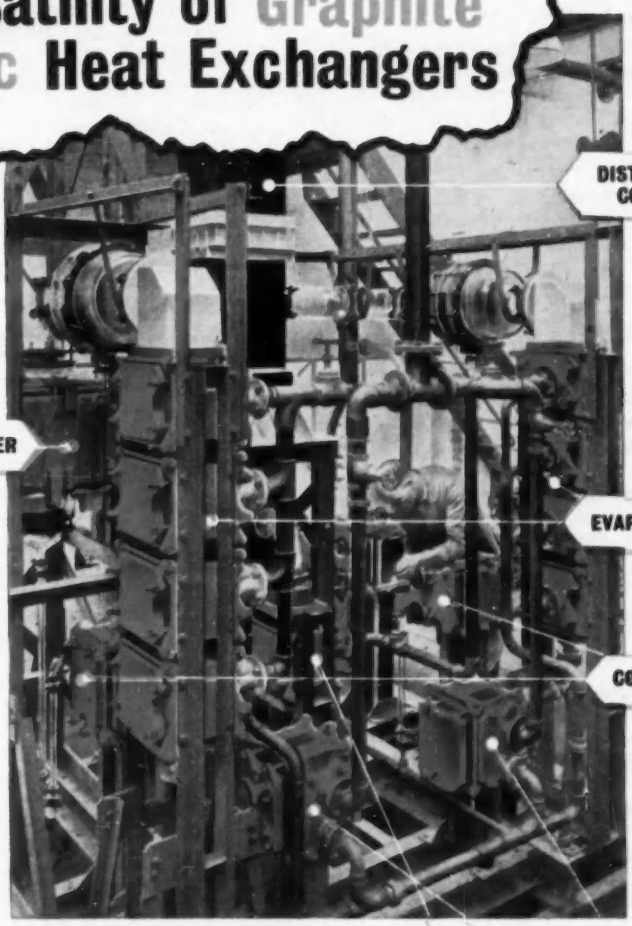
R. Hovenden & Sons

The directors have decided to place the company into voluntary liquidation and to hold a meeting early next year to consider the proposal of Timothy Whites & Taylors, controllers of all the ordinary, and 14,932 of the 'A' preference shares, offering 25s. per share to holders of Hovenden's seven per cent cumulative 'A' preference shares. Under the articles of association the 100,000 'A' preference shares are repayable in a liquidation at 20s. per share together with arrears of dividend up to the date of commencement of liquidation.

Kern Oil Co.

The directors have recommended a dividend for the year ended 31 May, 1955, of 17½ per cent and a bonus of 7½ per cent, both as before, absorbing £173,039 (£165,516) net. In 1953-54, production from the company's wells in Trinidad and California was the highest since 1941, but the expansion was not held in 1954-55, the output to 31 May last at 313,000 tons showing a decline of 5 per cent.

Versatility of Graphite Cubic Heat Exchangers



The photograph shows a complete plant designed to evaporate a liquor containing Hydrochloric acid, to recover, by condensation and distillation, the Hydrochloric acid evolved, and finally to cool all products to room temperature. ***'Delanium' Graphite Cubic Heat Exchangers*** shown in this illustration have been adapted to perform all the above heat transfer operations and demonstrably provide compact, robust and versatile corrosion free plant

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Next Week's Events

MONDAY 14 NOVEMBER

Society of Chemical Industry

Bradford: Technical College, 7 p.m. Joint meeting with Bradford Chemical Society. 'A Theory of Drying Sheet Materials Using Heated Cylinders' by Professor A. H. Nissan, D.Sc., Ph.D., A.M.I.Mech.E., F.Inst.P., F.R.I.C.

RIC (London Section)

London: Woolwich Polytechnic, S.E.18, 6.45 p.m. 'Ion Exchange Resins' by T. V. Arden, B.Sc., Ph.D., F.R.I.C.

Institute of Metal Finishing

London: Charing Cross Hotel (Thames Room), W.C.2, 11 a.m. Presidential Address. 'Research & Industrial Application in Metal Finishing' by R. A. F. Hammond, B.Sc., A.R.C.S., F.R.I.C., at 3 p.m.

British Ceramic Society.

Stoke-on-Trent: North Staffordshire Technical College, 7.30 p.m. 'A Method of Studying the Maturing of Glazes' by H. Edwards & A. W. Norris, B.Sc., A.Inst.P., F.I.Ceram.

TUESDAY 15 NOVEMBER

Institution of Chemical Engineers

London: The Geological Society, Burlington House, Piccadilly, W.1, 5.30 p.m. 'An Assessment of Dry-blending Equipment' by F. E. Adams, B.Sc., & A. G. Baker, B.Sc.

WEDNESDAY 16 NOVEMBER

Institution of Chemical Engineers

Leeds: The University, 7 p.m. 'Recent Developments in Pressure Vessel Construction' by S. H. Griffiths.

Institute of Metal Finishing

Birmingham: Mason Theatre, Birmingham University, Edmund Street, 6.30 p.m. 'Modern Painting & Stoving Techniques, Including Flow Coatings' by J. J. Stordy, B.Sc., & W. G. J. Appleton, A.M.I.Mech.E., M.Inst.F.

Institution of Chemical Engineers (Graduates' & Students' Section)

Birmingham: The University, Edmund Street, 6.30 p.m. Colour film, 'Cooling Water for Industry'.

The Polarographic Society

London: The Royal Institution, 21 Albermarle Street, W.1, 7.30 p.m. 'Recent Advances in Polarography' by Professor J. Heyrovsky, of the Polarographic Institute of the Czechoslovak Academy of Science.

RIC (London Section)

London: Institute of Metals, Grosvenor Gardens, S.W.1, 6.30 p.m. Annual general meeting. President's Address: 'A Progressive Institute' by Dr. D. W. Kent-Jones, B.Sc., F.R.I.C.

THURSDAY 17 NOVEMBER

Oil & Colour Chemists' Association

London: Royal Society of Tropical Medicine & Hygiene, Manson House, 26 Portland Place, W.1, 7 p.m. 'Recent Developments in Polyester Resins' by E. M. Evans, Ph.D., B.Sc., A.R.C.S., D.I.C. F.R.I.C.

SCI (Yorkshire Section)

Leeds: Chemistry Lecture Theatre, The University, 7 p.m. Liversidge Lecture: 'Reactions of Radicals in Gaseous Systems' by E. W. R. Stacie, O.B.E., Ph.D., D.Sc., F.R.S.

SCI (Road & Building Group)

London: Lecture Hall, Junior Institution of Engineers, Pepy's House, 14 Rochester Row, S.W.1, 6 p.m. 'Organic Matter in Soil in Relation to Soil-Cement Stabilisation' by K. E. Clare, B.Sc., & P. T. Sherwood, B.Sc.

The Chemical Society

Bristol: Chemistry Department, The University, 7 p.m. 'Principles of Crystal Growth' by Professor F. C. Frank, F.R.S.

London: Large Chemistry Lecture Theatre, Imperial College of Science & Technology, South Kensington, S.W.7, 7.30 p.m. 'Some Developments in the Study of Physical Adsorption' by Professor D. H. Everett, M.B.E., M.A., D.Phil.

FRIDAY 18 NOVEMBER

The Chemical Society

Cambridge: The University Chemical Laboratory, Pembroke Street, 8.30 p.m. 'Many-Centre Bonds' by Professor H. C. Longuet-Higgins, M.A.

St. Andrews: Chemistry Department, St. Salvators College, St. Andrews, Scotland, 5.15 p.m. 'The Hydrogen Isotope Effect in Reaction Kinetics' by R. P. Bell, M.A., F.R.S.

[continued on page 1076

Trouble with Precipitation?

Owing to its great tendency to form stable water-soluble complexes with heavy metal ions, Sequestrol (ethylene diamine tetra-acetic acid Geigy) can prevent the precipitation of many normally insoluble substances such as calcium carbonate, barium sulphate, etc., etc. For this reason it is of great value in eliminating incompatibilities in pharmaceuticals, preventing haze and sludge formation, controlling the effects of water hardness and many similar applications.

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SCI (Corrosion Group)

London: Institution of Electrical Engineers, Savoy Place, W.C.2, in three sessions: 10 to 12.30 p.m., 2.30 to 4.30 p.m., 5.15 to 7 p.m. A symposium: 'The Protection of Cable Sheathing'.

Market Reports

LONDON.—The demand for chemicals remains at a good level both on home account and for export, and interest in new business is well spread over the chief consumer industries. The potash and soda chemicals are moving well at unchanged rates and in other directions prices continue to display a firm undertone. Fertiliser demand is good for the period and active conditions are expected to continue. Among the coal-tar products pitch and the naphthalenes have been in good request while cresylic acid and creosote oil are being taken up in good quantities.

MANCHESTER.—The past week has seen little alteration in general conditions on the Manchester chemical market, both as regards the volume of business and the trend of prices. In most lines good quantities are being taken up against contracts, and a fair amount of replacement buying has again been reported on account of the leading industrial outlets. Shippers' inquiries have also been on a fair scale. In basic slag and the compounds a steady movement of supplies continues, with most other sections of the fertiliser trade moderately active. The demand for the light and heavy tar products keeps up at a satisfactory level.

GLASGOW.—As compared with last week, business generally in the Scottish heavy chemical market has shown an improvement, and a rather better week's trading has to be reported. Orders and inquiries received have covered a fairly large range of chemicals, and although deliveries called for are mostly prompt and against current requirements, some forward deliveries have been placed.

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Electro-Chemical Engineering Co. Ltd., 161 Queen's Road, Weybridge, Surrey, will shortly open a new factory at nearby Sheerwater.

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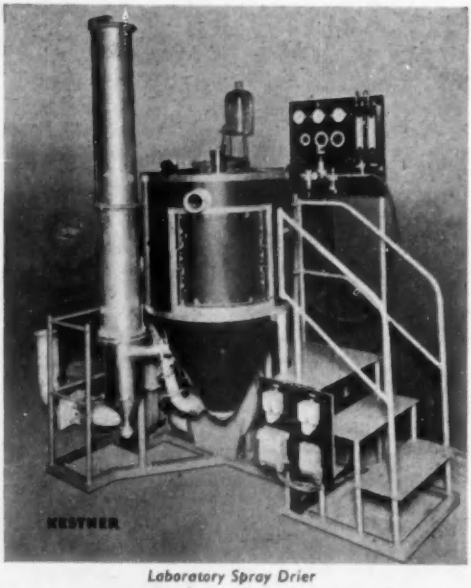

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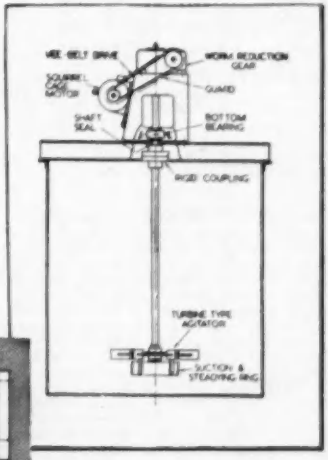

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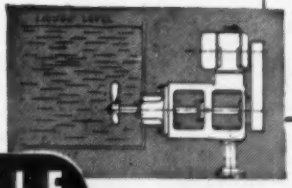

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LABORATORY ASSISTANTS. Hardman & Holden have a few vacancies in their Research and Works Laboratories. Applicants must have obtained their O.N.C. The company is expanding and offers interesting and varied opportunities. Applications, in writing, to **PERSONNEL OFFICER, COLESHILL STREET, MILES PLATTING, MANCHESTER, 10.**

MINISTRY OF SUPPLY requires Assistant Experimental Officers and Experimental Officers, as follows:—(1) Ref. F.808/5A CHEMIST (A.E.O. or E.O.) at Farnborough, Hants, to undertake investigations on application of textiles for Service purposes. (2) Ref. F.809/5A CHEMISTS or CHEMICAL ENGINEERS (A.E.O.) at establishment in S.W. England for experimental work connected with development of chemical processes. **Qualifications.**—Higher School Certificate (Science) or equivalent but H.N.C. or Degree in Chemistry or Chemical Engineering an advantage. Salary within range—E.O. (min. age 26), £745-£920; A.E.O., £306 10s. (age 18) to £670. Women's salary subject to equal pay scheme. Application forms from M.L.N.S., Technical & Scientific Register (K), 26, King Street, London, S.W.1., quoting appropriate reference.

WANTED for Heavy Chemical Works in S.W. Lancashire, Qualified **MAINTENANCE ENGINEER**, age 30 to 40, preferably one with experience in Electrical Engineering. Pension Scheme. Good prospects for the right man. Apply, in writing, giving full details of education, qualifications and experience, to **McKECHNIE BROTHERS, LTD., P.O. BOX No. 4, WIDNES, LANCS.**

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Candidates must have obtained a University Degree with first or second class honours in an appropriate Scientific subject (including Engineering), or in Mathematics, or an equivalent qualification; or possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' post-graduate or other approved experience.

AGE LIMITS.—Senior Scientific Officers, between 26 and 31, but specially suitable candidates under 26 may be admitted; for Scientific Officers, between 21 and 28 during 1955 (up to 31 for permanent members of the Experimental Officer class). Salary (London): Senior Scientific Officers (men), £1,070-£1,245; (women) £933-£1,137. Scientific Officers: (men) £513-£925; (women) £513-£835. Women's scales subject to improvement under equal pay scheme. Somewhat lower rates in the provinces.

Further particulars from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1, quoting No. S.53/55, for Senior Scientific Officers and S.52/55 for Scientific Officers.
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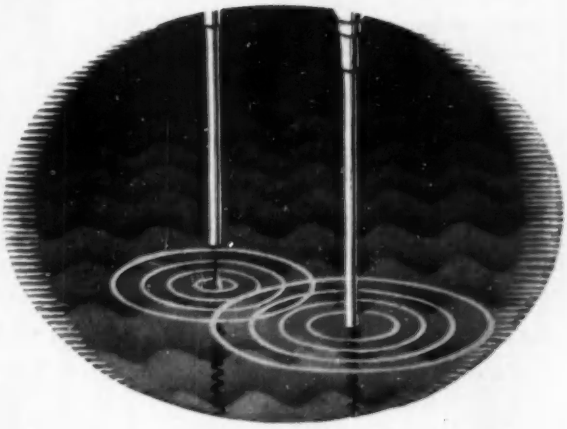

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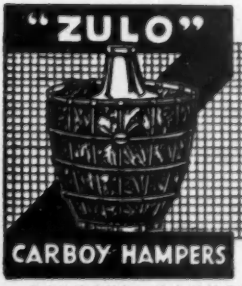

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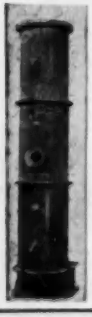

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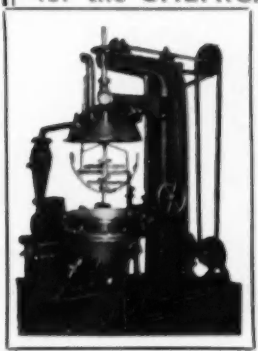

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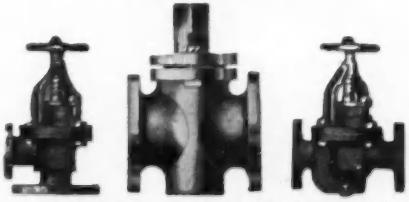

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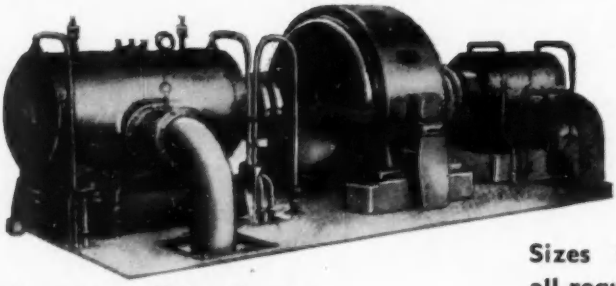

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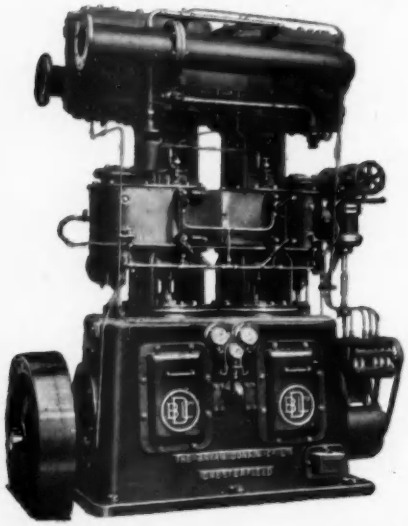

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